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TECHNICAL NOTE

No. 1553

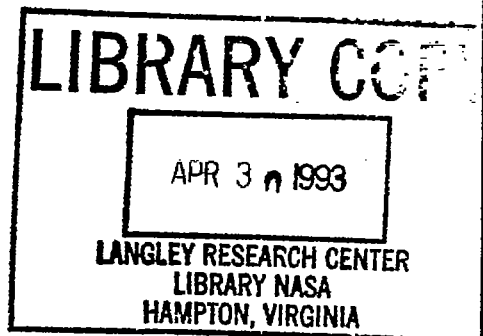
COMPRESSIVE STRENGTH OF 24S-T ALUMINUM-ALLOY FLAT PANELS
WITH LONGITUDINAL FORMED HAT-SECTION STIFFENERS HAVING
FOUR RATIOS OF STIFFENER THICKNESS TO SKIN THICKNESS

By William A. Hickman and Norris F. Dow

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Langley Field, Va.



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COMPRESSIVE STRENGTH OF 24S-T ALUMINUM-ALLOY FLAT PANELS
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SUMMARY

Results are presented for a test program on 24S-T aluminum-alloy flat compression panels with longitudinal formed hat-section stiffeners. The results for panels in which the thicknesses of the stiffener material are 0.39 and 1.25 times the skin thickness are presented and incorporated with the results previously presented for panels in which the thicknesses of the stiffener material are 0.63 and 1.00 times the skin thickness. The results, presented in tabular and graphical form, show the effect of the relative dimensions of a panel on the buckling stress and the average stress at failure.

INTRODUCTION

An extensive experimental investigation of the strength of 24S-T aluminum-alloy flat compression panels with longitudinal formed Z-section stiffeners was reported in reference 1. The data presented in reference 1 were reworked on the basis of a selected design parameter and were used for the preparation of design charts in reference 2. A similar investigation is now being completed on panels of the same material with formed hat-section stiffeners in order to make design charts and also to provide an eventual comparison of the structural efficiencies of the two types of stiffener.

This compression-panel test program consisted of four parts. The first two parts, for which the thicknesses of the stiffener material were 0.63 and 1.00 times the skin thickness, were reported in references 3 and 4. The last two parts, for which the thicknesses of the stiffener material were 0.39 and 1.25 times the skin thickness, have now been completed and are presented herein with the results of the first two parts.

The present paper deals only with the data as obtained; no attempt has yet been made to prepare design charts from these data.

SYMBOLS

Symbols for dimensions of panel cross sections are shown in figure 1. In addition, the following symbols are used:

| | |
|------------------|---|
| P_1 | compressive load per inch of panel width, kips per inch |
| \bar{t} | cross-sectional area per inch of panel width, expressed as an equivalent or average thickness, inches |
| L | length of panel, inches |
| c | coefficient of end fixity in Euler column formula |
| σ_{cr} | local-buckling stress of skin or stiffener, ksi |
| $\bar{\sigma}_f$ | average stress at failure, ksi |

TEST SPECIMENS

A typical cross section of the test panels is shown in figure 1. Both the skin and the stiffeners were made of 24S-T aluminum-alloy sheet with the grain of the material parallel to the longitudinal axis of the panels. The with-grain compressive yield strength of the skin material ranged between 42.2 ksi and 47.9 ksi with an average of 43.8 ksi and that of the stiffener material before forming varied between 41.9 ksi and 46.2 ksi with an average of 44.3 ksi.

For the tests reported herein, the nominal thicknesses of the skin material were 0.102 inch, 0.064 inch, 0.040 inch, and 0.032 inch and the nominal stiffener thickness was 0.040 inch. The nominal ratios of the stiffener thickness to the skin thickness t_w/t_s were therefore constant, the values being 0.39, 0.63, 1.00, and 1.25, respectively. With these dimensions known, numerical values for all other cross-sectional dimensions can be found by means of the proper dimension ratios. The stiffeners were formed from flat sheet to an inside radius of 0.125 inch for all bends ($\frac{r_A}{t_w} \approx 3$). For panels having $\frac{t_w}{t_s} = 0.39, 0.63, 1.00,$ and 1.25, the widths of the attachment flange b_A were 0.85 inch, 0.75 inch, 0.65 inch, and 0.55 inch, respectively. The rivet lines on the stiffeners were on the longitudinal center lines of the attachment flanges.

The NACA flush-riveting method (method E of reference 5) was employed in the construction of the test specimens. The rivet holes were countersunk on the skin side of the panel to a depth of three-fourths of the skin thickness, the countersink having an included angle of 60° . Ordinary flat-head Al7S-T aluminum-alloy rivets were inserted from the

stiffener side, and the shanks were upset into the countersunk cavity. The protruding part of the upset shank was then milled off to provide a smooth surface. The rivet diameters and rivet pitches used are shown in the following table:

| t_w/t_s | Rivet diameter (in.) | Rivet pitch (in.) |
|-----------|----------------------|-------------------|
| 0.39 | 3/16 | 1 |
| .63 | 5/32 | 3/4 |
| 1.00 | 1/8 | 1/2 |
| 1.25 | 3/32 | 3/8 |

METHOD OF TESTING

The specimens were tested flat-ended, without side support, in the 1,200,000-pound-capacity testing machine at the Langley structures research laboratory. Within the range of loads used, the indicated load on the testing machine was within one-half of 1 percent of the applied load. Provisions were made for setting the specimens in the testing machine in such a manner as to maintain the flatness of the panels and afford uniform bearing at the ends. Figure 2 shows a failed panel in the testing machine.

Resistance-type wire strain gages were used to measure strains at successive increments of load. The gages were placed in those locations on the stiffeners and skin where buckles were expected to appear first.

METHODS OF TREATING TEST DATA

In reference 6, the coefficient of end fixity c was found to be about 3.75 for panels which were tested flat-ended in the same testing machine used in the present investigation. Because the panels of this investigation are similar to the panels of reference 6, this value of c was used in working up the present data.

In order to obtain the average stress at failure $\bar{\sigma}_f$, the load at which failure occurred was divided by the cross-sectional area of the panel. No adjustment was made to offset the effect of having an unequal number of stiffeners and bays. The effect of such an adjustment would

be to decrease slightly the values of $\bar{\sigma}_f$ at high values of $\frac{b_s}{t_s}$ and $\frac{P_1}{L/\sqrt{c}}$. Inasmuch as the purpose of the present paper is to present test data, however, and not to prepare final design charts, the adjustment was considered unwarranted.

The local buckling load was determined by the "strain-reversal method" (see reference 7) as the load at which a plot of the strains near the crest of a buckle first shows a decreasing strain with increasing load. The buckling load was divided by the cross-sectional area of the panel to give the observed buckling stress. An adjustment was made in the observed buckling stress to correct for slight variations of the actual dimensions from the nominal dimensions of the specimens. The method for making the adjustment is explained in the appendix of reference 3.

Because stresses are determined by the relative rather than by the absolute dimensions of the panels, nondimensional ratios are used in presenting the data. In reference 2 the quantity $\frac{P_1}{L/\sqrt{c}}$ is developed as a suitable parameter against which to plot the average stress at maximum load. This parameter is used in plotting the results of the tests in the present investigation.

RESULTS AND CONCLUSIONS

The primary results of this investigation are to be found in tables 1 to 16 and figures 3 to 18.

Tables 1 to 16 (facing figs. 3 to 18, respectively) list both the observed and the adjusted buckling stresses, together with the average stress at failure, for corresponding values of $\frac{P_1}{L/\sqrt{c}}$. The nominal values of \bar{t}/t_s are included in the tables for convenience in making comparisons with other panels. Values of L/\sqrt{c} are also given.

In figures 3 to 18 the average stress at failure $\bar{\sigma}_f$ is plotted against $\frac{P_1}{L/\sqrt{c}}$ for the various dimension ratios used. The initial dashed parts of the curves were computed from the column strength of the panels based on nominal dimensions and the combination of Euler and straight-line column curves recommended for 24S-T aluminum-alloy material in reference 8; the solid-line parts of the curves were drawn through the experimental test points.

The following conclusions may be drawn regarding the effect of the various dimension ratios on the strength of the test panels. It is

assumed that as each dimension ratio is changed all others remain constant. These conclusions can only be considered to apply within the range of panels tested.

1. At very low values of $\frac{P_1}{L\sqrt{C}}$ (long panels that fail by column bending), the stress developed by the panels increases with an increase in b_W/t_W because an increase in the height of the stiffeners provides increased column strength. For high values of $\frac{P_1}{L\sqrt{C}}$ (short panels that fail by local buckling), however, the stress generally decreases as b_W/t_W increases because an increase in the height of the stiffeners decreases the local-buckling strength.

2. At very high values of $\frac{P_1}{L\sqrt{C}}$ (short panels that fail by local buckling), an increase in the ratio b_H/t_W tends to decrease the stress developed by the panels because an increase in the width of the stiffeners tends to decrease the local-buckling strength.

3. Except at very low values of $\frac{P_1}{L\sqrt{C}}$ (long panels that fail by column bending), the stress developed by the test panels tends to increase as b_S/t_S is decreased because a decrease in the stiffener spacing increases the local-buckling strength.

Langley Memorial Aeronautical Laboratory
National Advisory Committee for Aeronautics
Langley Field, Va., February 2, 1948

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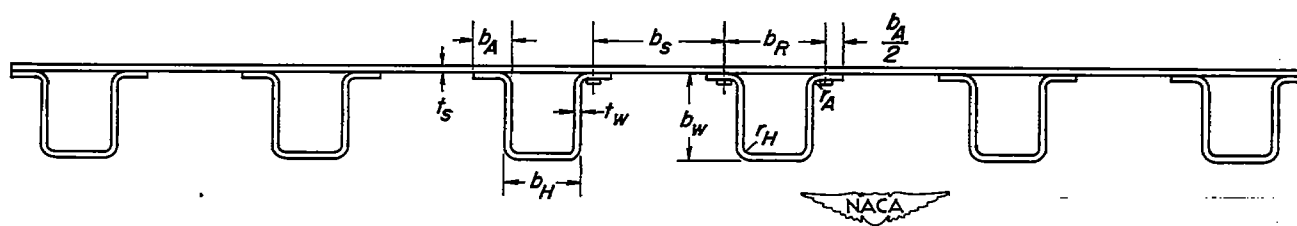
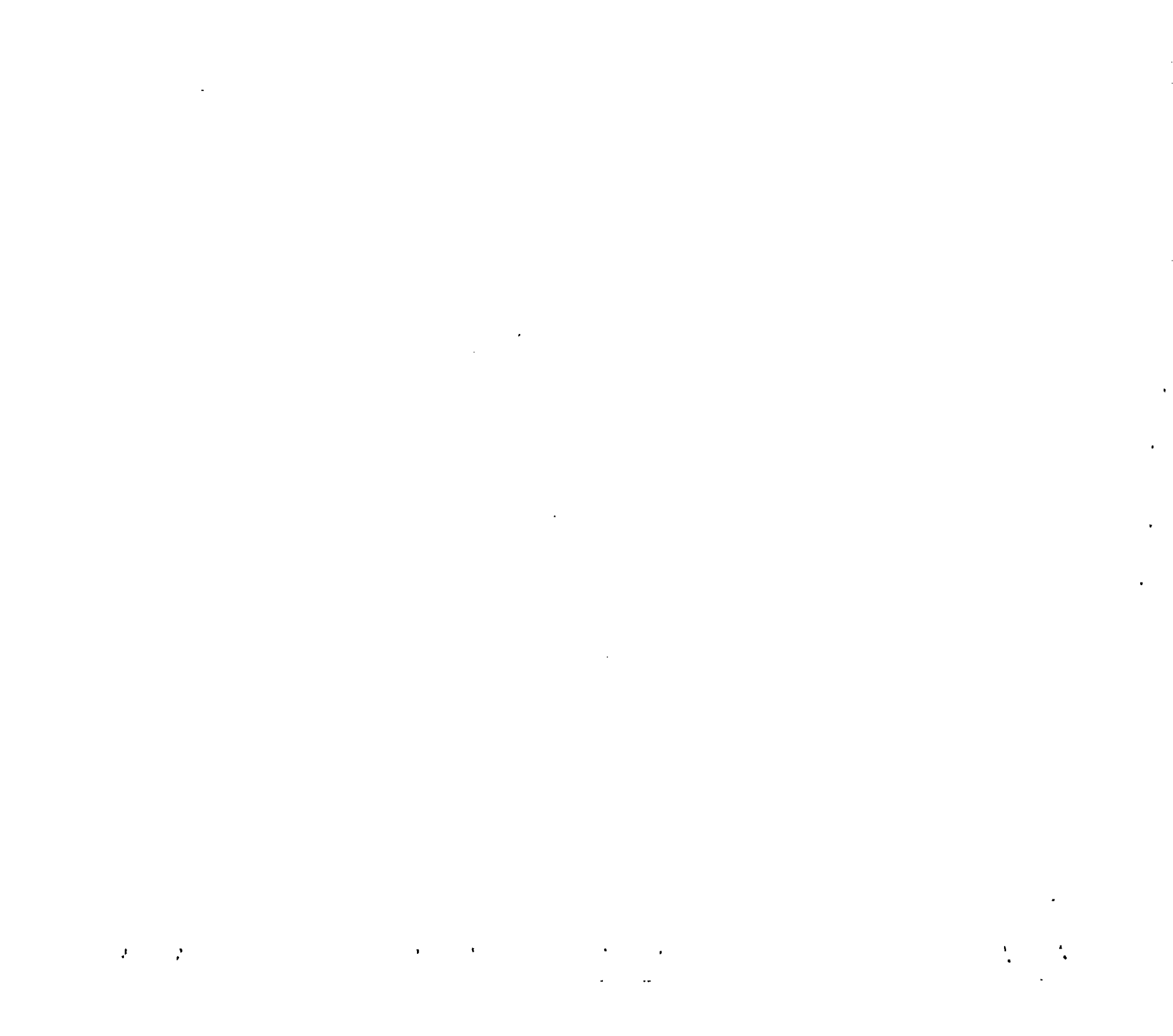


Figure 1.- Cross section of a test panel.



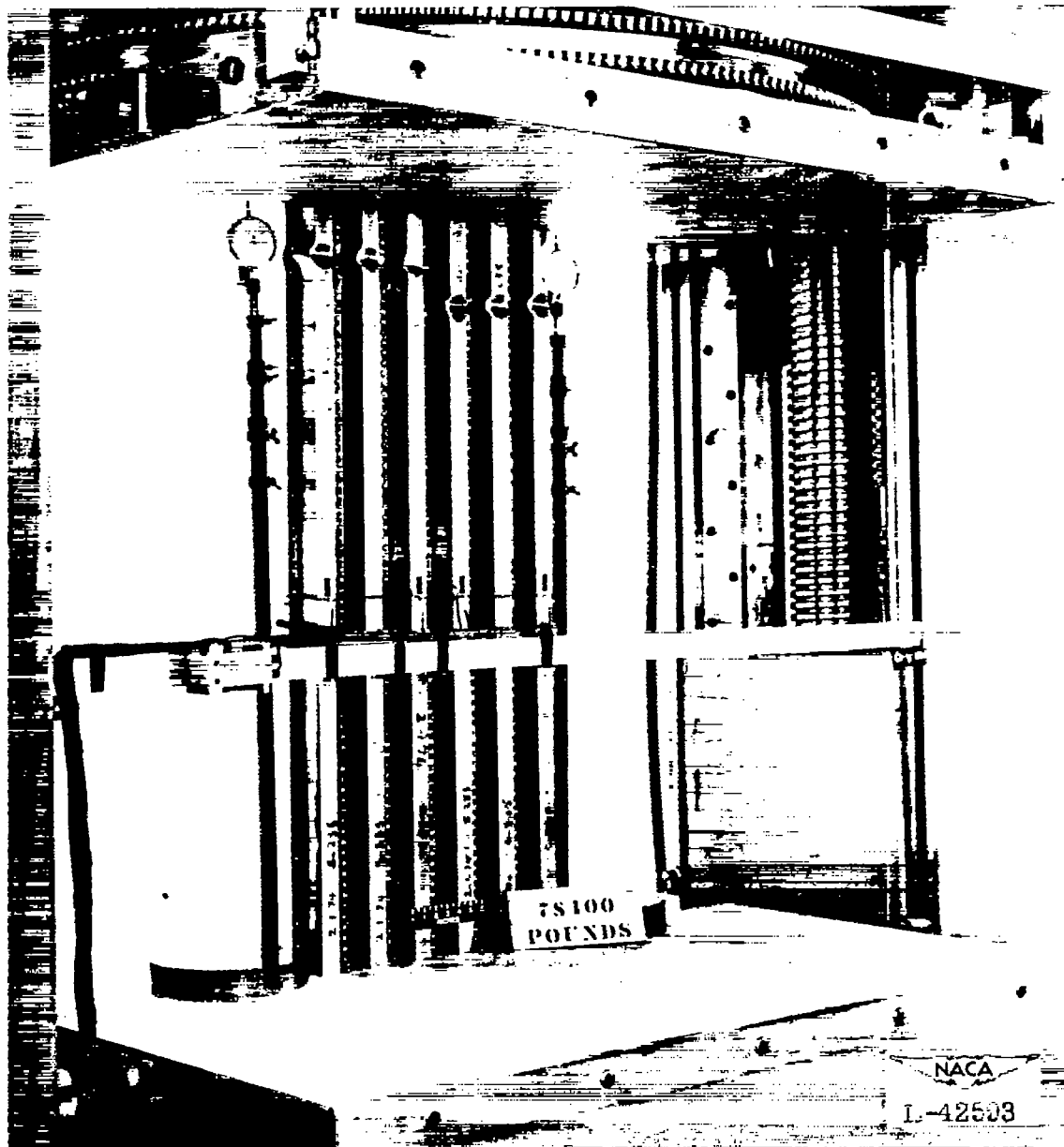


Figure 2.- Panel after failure.



TABLE 1
 TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{t_W}{t_B} = 0.39$, $\frac{b_H}{b_W} = 0.6$
 [Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|---------------------------------|------------------------------|------------------------|----------|---------------------|---|
| t_W (in.) | $\frac{t_W}{t_B}$ | $\frac{b_B}{t_B}$ | $\frac{b_W}{t_W}$ | $\frac{b_H}{b_W}$ | $\frac{L}{\sqrt{b_W}}$ (in.) | \bar{t} $\frac{t}{t_B}$ | σ_{or} (ksi) | | σ_r (ksi) | P_1 $\frac{P_1}{L\sqrt{b_W}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (0.39) | (25) | (20) | (0.6) | | | | | | |
| 0.040 | 0.392 | 25.1 | 19.9 | 0.60 | 3.14 | (1.349) | 31.3 | 29.6 | 33.7 | 1.474 |
| 0.039 | 0.384 | 25.8 | 20.3 | 0.61 | 5.28 | | 31.2 | 28.8 | 33.9 | 0.859 |
| 0.040 | 0.386 | 24.0 | 19.9 | 0.61 | 8.40 | | --- | --- | 29.6 | 0.856 |
| 0.040 | 0.389 | 24.1 | 20.0 | 0.60 | 12.53 | | --- | --- | 19.8 | 0.217 |
| 0.039 | 0.378 | 24.0 | 30.6 | 0.59 | 5.31 | (1.430) | --- | --- | 33.2 | 0.911 |
| 0.039 | 0.376 | 23.9 | 30.6 | 0.60 | 8.90 | | 31.7 | 33.0 | 32.4 | 0.530 |
| 0.040 | 0.374 | 23.4 | 30.2 | 0.60 | 14.26 | | --- | --- | 31.0 | 0.317 |
| 0.040 | 0.362 | 24.0 | 30.5 | 0.60 | 21.35 | | 14.3 | 15.4 | 15.5 | 0.106 |
| 0.039 | 0.378 | 23.9 | 40.6 | 0.60 | 7.67 | (1.499) | --- | --- | 30.7 | 0.611 |
| 0.040 | 0.381 | 23.9 | 40.2 | 0.61 | 12.85 | | 28.0 | 27.0 | 28.4 | 0.343 |
| 0.040 | 0.381 | 23.9 | 40.4 | 0.60 | 20.51 | | 27.2 | 27.7 | 29.4 | 0.219 |
| 0.040 | 0.383 | 23.8 | 40.2 | 0.60 | 30.76 | | --- | --- | 21.4 | 0.106 |
| 0.039 | 0.378 | 23.8 | 61.3 | 0.60 | 12.53 | (1.621) | 14.9 | 15.6 | 25.2 | 0.333 |
| 0.040 | 0.380 | 24.0 | 60.7 | 0.61 | 20.98 | | 15.1 | 15.7 | 24.3 | 0.191 |
| 0.039 | 0.374 | 24.6 | 61.2 | 0.60 | 33.48 | | 14.4 | 14.9 | 24.1 | 0.119 |
| 0.040 | 0.376 | 23.8 | 60.6 | 0.60 | 50.25 | | 13.0 | 13.3 | 16.8 | 0.055 |
| 0.039 | 0.393 | 35.5 | 20.3 | 0.62 | 2.93 | (1.275) | 26.0 | 26.6 | 31.3 | 1.391 |
| 0.039 | 0.394 | 35.0 | 19.7 | 0.64 | 4.83 | | 23.3 | 23.3 | 30.2 | 0.813 |
| 0.039 | 0.393 | 34.8 | 20.4 | 0.62 | 7.69 | | 23.5 | 23.3 | 26.5 | 0.447 |
| 0.039 | 0.393 | 34.5 | 19.8 | 0.64 | 11.62 | | --- | --- | 16.1 | 0.140 |
| 0.039 | 0.380 | 34.5 | 30.2 | 0.60 | 4.98 | (1.342) | 24.6 | 22.9 | 29.9 | 0.821 |
| 0.039 | 0.382 | 34.0 | 30.2 | 0.60 | 8.36 | | 24.1 | 23.1 | 29.1 | 0.476 |
| 0.039 | 0.379 | 34.2 | 31.0 | 0.58 | 13.33 | | 25.6 | 24.9 | 27.6 | 0.264 |
| 0.038 | 0.380 | 34.7 | 31.4 | 0.58 | 19.96 | | --- | --- | 19.7 | 0.135 |
| 0.039 | 0.391 | 35.0 | 41.1 | 0.58 | 7.25 | (1.404) | 25.8 | 27.2 | 27.1 | 0.535 |
| 0.040 | 0.392 | 35.0 | 40.4 | 0.60 | 12.05 | | 26.8 | 27.0 | 27.0 | 0.321 |
| 0.039 | 0.379 | 33.6 | 40.8 | 0.60 | 19.33 | | 25.8 | 28.0 | 26.8 | 0.198 |
| 0.040 | 0.393 | 34.5 | 40.4 | 0.60 | 28.99 | | 20.3 | 23.7 | 21.2 | 0.105 |
| 0.040 | 0.388 | 34.4 | 60.9 | 0.60 | 5.01 | (1.510) | 14.0 | 14.4 | 22.3 | 0.284 |
| 0.039 | 0.388 | 34.4 | 60.9 | 0.60 | 8.35 | | 14.5 | 14.8 | 22.0 | 0.169 |
| 0.040 | 0.382 | 33.6 | 60.2 | 0.60 | 13.35 | | 13.6 | 13.6 | 21.3 | 0.103 |
| 0.040 | 0.389 | 34.2 | 60.2 | 0.60 | 20.07 | | 12.9 | 13.0 | 17.2 | 0.055 |
| 0.040 | 0.382 | 48.7 | 20.0 | 0.63 | 2.72 | (1.208) | 22.3 | 26.0 | 27.3 | 1.238 |
| 0.039 | 0.380 | 49.0 | 20.0 | 0.63 | 4.46 | | 15.7 | 15.1 | 26.4 | 0.730 |
| 0.039 | 0.384 | 48.8 | 20.4 | 0.60 | 7.02 | | 13.3 | 12.7 | 23.9 | 0.419 |
| 0.039 | 0.384 | 49.2 | 20.4 | 0.60 | 10.58 | | 14.2 | 13.8 | 17.6 | 0.205 |
| 0.039 | 0.398 | 51.0 | 30.8 | 0.60 | 4.59 | (1.262) | 14.7 | 15.4 | 26.1 | 0.733 |
| 0.039 | 0.396 | 50.7 | 30.3 | 0.60 | 7.64 | | 14.4 | 14.8 | 25.0 | 0.421 |
| 0.039 | 0.394 | 49.8 | 30.4 | 0.60 | 12.17 | | 14.4 | 14.3 | 24.0 | 0.254 |
| 0.039 | 0.381 | 48.6 | 30.5 | 0.62 | 18.37 | | 15.7 | 14.8 | 17.5 | 0.123 |
| 0.039 | 0.399 | 51.0 | 40.6 | 0.60 | 6.72 | (1.313) | 14.3 | 14.9 | 24.6 | 0.490 |
| 0.040 | 0.396 | 50.9 | 40.6 | 0.60 | 11.26 | | 13.4 | 12.9 | 23.6 | 0.282 |
| 0.040 | 0.398 | 50.4 | 40.7 | 0.60 | 17.94 | | 15.9 | 16.1 | 23.5 | 0.176 |
| 0.040 | 0.398 | 50.0 | 40.1 | 0.60 | 26.82 | | 13.7 | 13.7 | 20.9 | 0.104 |
| 0.040 | 0.389 | 49.3 | 60.2 | 0.61 | 11.34 | (1.404) | 13.8 | 13.9 | 20.4 | 0.258 |
| 0.039 | 0.387 | 49.2 | 61.7 | 0.60 | 18.87 | | 15.8 | 16.7 | 20.7 | 0.157 |
| 0.039 | 0.388 | 49.5 | 61.0 | 0.60 | 30.12 | | 14.4 | 14.9 | 18.8 | 0.089 |
| 0.040 | 0.387 | 49.4 | 60.7 | 0.60 | 45.25 | | 12.4 | 12.7 | 16.8 | 0.053 |
| 0.039 | 0.379 | 73.5 | 20.0 | 0.61 | 2.35 | (1.148) | 17.4 | 16.7 | 22.4 | 1.118 |
| 0.039 | 0.379 | 73.4 | 20.4 | 0.61 | 3.87 | | 11.3 | 10.8 | 20.8 | 0.628 |
| 0.039 | 0.378 | 73.2 | 19.6 | 0.63 | 6.16 | | 7.8 | 7.4 | 17.2 | 0.327 |
| 0.039 | 0.382 | 73.8 | 19.9 | 0.62 | 9.33 | | 8.8 | 8.5 | 14.6 | 0.184 |
| 0.040 | 0.386 | 73.6 | 30.8 | 0.60 | 4.09 | (1.189) | 13.4 | 12.9 | 22.9 | 0.678 |
| 0.039 | 0.380 | 73.0 | 30.4 | 0.60 | 6.71 | | 8.6 | 8.1 | 22.0 | 0.397 |
| 0.040 | 0.382 | 72.4 | 30.3 | 0.58 | 10.84 | | 8.0 | 7.5 | 20.4 | 0.228 |
| 0.040 | 0.380 | 72.0 | 30.0 | 0.61 | 16.27 | | 7.5 | 6.9 | 18.0 | 0.134 |
| 0.040 | 0.398 | 76.2 | 41.0 | 0.60 | 6.11 | (1.229) | 7.8 | 8.1 | 20.6 | 0.421 |
| 0.040 | 0.394 | 72.4 | 39.2 | 0.60 | 10.33 | | 7.2 | 7.1 | 21.0 | 0.262 |
| 0.040 | 0.397 | 72.4 | 40.1 | 0.60 | 16.01 | | 8.6 | 8.0 | 21.1 | 0.165 |
| 0.040 | 0.382 | 72.8 | 40.1 | 0.60 | 24.18 | | 7.8 | 7.4 | 18.9 | 0.098 |
| 0.039 | 0.378 | 73.2 | 60.4 | 0.62 | 10.74 | (1.299) | 8.6 | 8.2 | 18.8 | 0.241 |
| 0.039 | 0.390 | 75.4 | 61.0 | 0.59 | 17.24 | | 8.8 | 8.9 | 19.0 | 0.146 |
| 0.046 | 0.467 | 77.8 | 52.8 | 0.60 | 27.59 | | 6.5 | 7.0 | 20.1 | 0.097 |
| 0.046 | 0.452 | 75.8 | 52.5 | 0.60 | 41.48 | | 8.2 | 8.4 | 18.3 | 0.058 |

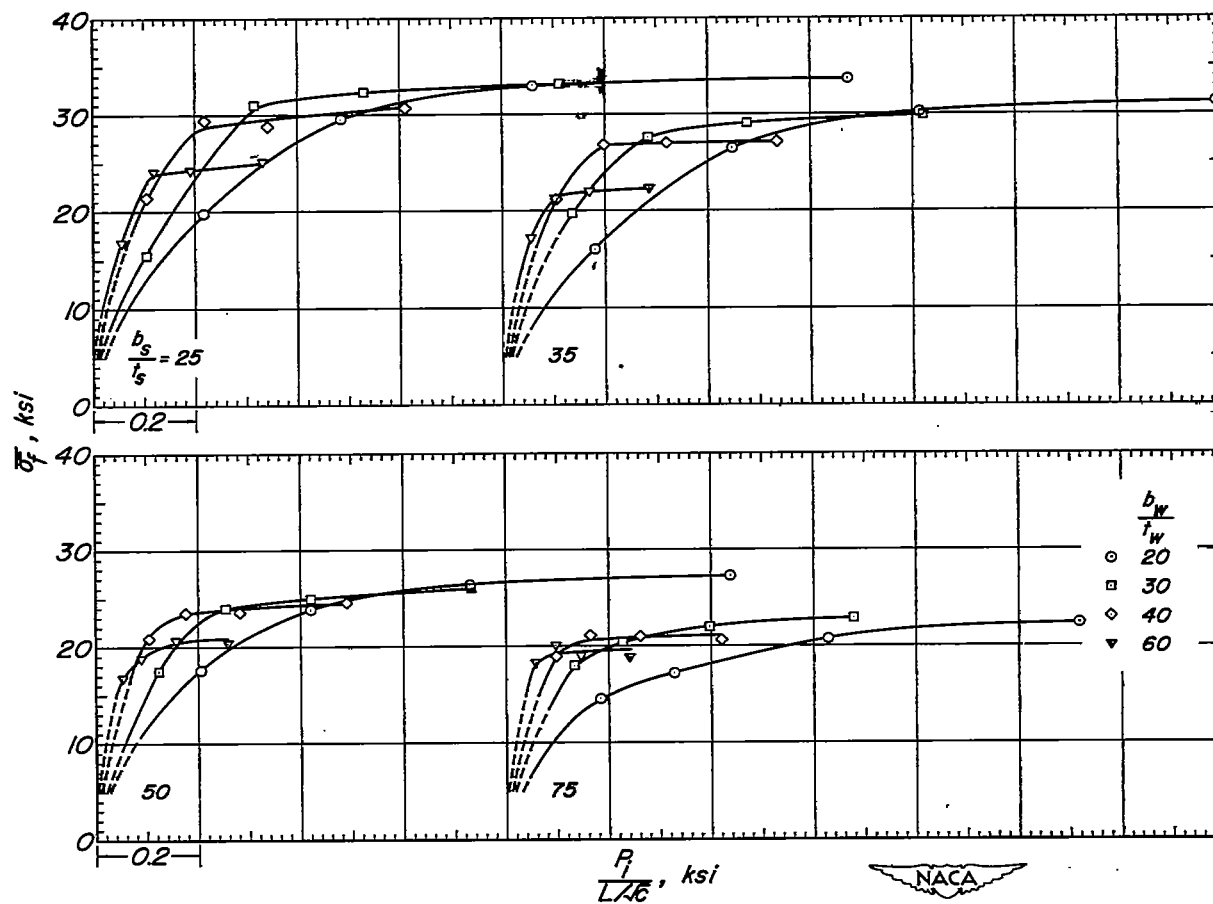


Figure 3.—Compressive strength of flat panels with hat-section stiffeners.

$$\frac{t_w}{t_s} = 0.39; \frac{b_H}{b_w} = 0.6.$$

TABLE 2

TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{t_w}{t_s} = 0.39$, $\frac{b_H}{b_W} = 0.8$

[Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|----------|---------------------|-----------------------------------|
| t_w (in.) | $\frac{t_w}{t_s}$ | $\frac{b_s}{t_s}$ | $\frac{b_w}{t_w}$ | $\frac{b_H}{b_W}$ | $\frac{L}{\sqrt{b}}$ (in.) | \bar{E} $\frac{E}{t_s}$ | σ_{cr} (ksi) | | σ_r (ksi) | $\frac{P_1}{L/\sqrt{b}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (0.39) | (25) | (20) | (0.8) | | | | | | |
| .040 | .386 | 24.2 | 19.8 | .82 | 3.32 | (1.350) | 29.9 | 31.6 | 34.2 | 1.418 |
| .040 | .387 | 24.8 | 20.1 | .81 | 5.68 | | 30.8 | 28.5 | 32.8 | .809 |
| .040 | .388 | 24.2 | 20.0 | .82 | 8.90 | | 29.8 | 28.3 | 30.5 | .472 |
| .040 | .388 | 24.0 | 19.8 | .81 | 13.32 | | -- | -- | 19.3 | .200 |
| | | | (30) | | | | | | | |
| .039 | .376 | 24.8 | 30.5 | .81 | 5.68 | (1.428) | -- | -- | 31.6 | .810 |
| .040 | .372 | 23.4 | 30.2 | .81 | 9.35 | | -- | -- | 32.2 | .501 |
| .039 | .376 | 23.4 | 30.4 | .80 | 14.97 | | 28.1 | 29.1 | 31.4 | .305 |
| .039 | .372 | 23.8 | 31.0 | .79 | 22.38 | | 18.0 | 18.7 | 18.9 | .123 |
| | | | (40) | | | | | | | |
| .040 | .386 | 24.2 | 40.5 | .80 | 8.04 | (1.493) | -- | -- | 29.3 | .554 |
| .040 | .384 | 23.8 | 40.6 | .80 | 13.42 | | -- | -- | 29.2 | .352 |
| .040 | .382 | 24.2 | 40.7 | .80 | 21.43 | | 27.6 | 28.4 | 28.4 | .201 |
| .040 | .384 | 24.2 | 40.6 | .80 | 32.09 | | -- | -- | 22.1 | .105 |
| | | | (60) | | | | | | | |
| .039 | .381 | 24.0 | 61.0 | .82 | 13.04 | (1.598) | 11.5 | 11.9 | 22.8 | .285 |
| .039 | .378 | 23.9 | 61.0 | .80 | 21.66 | | 12.4 | 12.8 | 23.5 | .177 |
| .040 | .388 | 24.3 | 60.6 | .80 | 34.62 | | 14.4 | 14.7 | 22.3 | .105 |
| .040 | .386 | 24.4 | 59.5 | .81 | 52.05 | | 12.6 | 12.9 | 15.5 | .049 |
| | | | (35) | | | | | | | |
| .039 | .391 | 34.7 | 20.5 | .82 | 3.01 | (1.280) | 25.3 | 28.7 | 30.6 | 1.327 |
| .039 | .394 | 35.0 | 20.2 | .81 | 5.16 | | 23.3 | 23.4 | 29.0 | .733 |
| .039 | .390 | 35.5 | 20.7 | .78 | 8.16 | | 24.2 | 24.8 | 28.6 | .457 |
| .039 | .388 | 35.2 | 20.6 | .79 | 12.33 | | -- | -- | 18.0 | .190 |
| | | | (30) | | | | | | | |
| .039 | .390 | 35.4 | 30.4 | .82 | 5.20 | (1.345) | 23.8 | 24.2 | 29.2 | .769 |
| .038 | .380 | 34.4 | 30.9 | .80 | 8.84 | | 22.9 | 22.0 | 27.6 | .428 |
| .039 | .392 | 35.5 | 30.8 | .78 | 14.02 | | 23.9 | 24.7 | 27.5 | .269 |
| .039 | .388 | 34.6 | 31.1 | .79 | 21.06 | | -- | -- | 20.6 | .134 |
| | | | (40) | | | | | | | |
| .039 | .390 | 34.8 | 40.9 | .78 | 7.58 | (1.403) | 23.9 | 25.7 | 24.7 | .466 |
| .039 | .390 | 35.0 | 41.0 | .80 | 12.62 | | 22.4 | 22.6 | 26.4 | .300 |
| .039 | .388 | 34.9 | 41.4 | .79 | 20.26 | | -- | -- | 25.2 | .178 |
| .040 | .395 | 35.0 | 40.5 | .80 | 30.28 | | -- | -- | 22.9 | .108 |
| | | | (60) | | | | | | | |
| .039 | .380 | 33.7 | 60.6 | .80 | 12.45 | (1.502) | 14.3 | 14.8 | 21.8 | .268 |
| .038 | .370 | 33.8 | 62.0 | .80 | 20.83 | | 14.8 | 16.0 | 21.9 | .161 |
| .039 | .379 | 33.8 | 60.8 | .81 | 33.31 | | 12.6 | 13.4 | 20.7 | .095 |
| .039 | .397 | 35.0 | 61.0 | .80 | 49.35 | | 11.9 | 12.3 | 15.1 | .047 |
| | | | (50) | | | | | | | |
| .040 | .394 | 50.3 | 19.8 | .83 | 2.80 | (1.213) | 21.1 | 21.5 | 29.9 | 1.323 |
| .039 | .398 | 51.3 | 20.6 | .78 | 4.76 | | 15.3 | 16.1 | 25.6 | .665 |
| .040 | .386 | 49.2 | 20.6 | .78 | 7.49 | | 16.0 | 15.5 | 23.0 | .380 |
| .039 | .386 | 49.0 | 20.2 | .82 | 11.27 | | 13.8 | 14.7 | 18.2 | .200 |
| | | | (30) | | | | | | | |
| .039 | .385 | 49.7 | 30.6 | .80 | 4.82 | (1.267) | 18.2 | 18.0 | 25.8 | .691 |
| .040 | .397 | 50.0 | 30.1 | .80 | 8.07 | | 13.8 | 13.8 | 24.3 | .388 |
| .039 | .395 | 49.4 | 30.9 | .80 | 12.94 | | 15.9 | 15.5 | 24.4 | .244 |
| .040 | .394 | 49.6 | 30.0 | .80 | 19.41 | | 15.6 | 15.4 | 18.1 | .120 |
| | | | (40) | | | | | | | |
| .039 | .397 | 50.6 | 40.5 | .79 | 7.08 | (1.318) | 15.4 | 15.8 | 23.7 | .448 |
| .040 | .408 | 51.9 | 39.8 | .80 | 11.80 | | 12.8 | 13.8 | 23.5 | .268 |
| .039 | .398 | 50.9 | 40.8 | .80 | 19.86 | | 14.1 | 14.6 | 22.6 | .162 |
| .040 | .400 | 50.1 | 40.0 | .80 | 28.33 | | 15.1 | 15.2 | 18.2 | .086 |
| | | | (60) | | | | | | | |
| .039 | .381 | 48.6 | 61.2 | .80 | 11.83 | (1.403) | 14.7 | 15.3 | 19.8 | .240 |
| .040 | .384 | 49.6 | 60.6 | .80 | 19.74 | | 13.0 | 13.2 | 19.7 | .143 |
| .040 | .381 | 48.2 | 59.8 | .82 | 31.52 | | 12.9 | 12.8 | 18.4 | .084 |
| .040 | .380 | 48.2 | 60.6 | .82 | 47.23 | | 11.9 | 12.1 | 15.4 | .047 |
| | | | (75) | | | | | | | |
| .039 | .382 | 73.8 | 20.2 | .80 | 2.56 | (1.153) | 12.7 | 12.3 | 22.1 | 1.017 |
| .039 | .380 | 74.2 | 20.6 | .80 | 4.16 | | 10.6 | 10.4 | 21.8 | .616 |
| .039 | .380 | 74.0 | 20.2 | .80 | 6.64 | | 8.5 | 8.3 | 20.1 | .355 |
| .039 | .380 | 74.4 | 20.6 | .82 | 9.97 | | 9.0 | 9.0 | 11.0 | .129 |
| | | | (30) | | | | | | | |
| .040 | .382 | 73.2 | 30.5 | .78 | 4.23 | (1.194) | 10.6 | 10.1 | 24.3 | .700 |
| .040 | .380 | 73.2 | 31.2 | .76 | 7.22 | | 9.8 | 9.4 | 22.4 | .377 |
| .040 | .378 | 72.6 | 30.7 | .78 | 11.57 | | 7.9 | 7.4 | 21.2 | .223 |
| .039 | .390 | 75.4 | 29.9 | .82 | 17.32 | | 7.0 | 7.0 | 17.3 | .122 |
| | | | (40) | | | | | | | |
| .040 | .382 | 72.9 | 40.6 | .79 | 6.45 | (1.233) | 7.4 | 6.2 | 21.0 | .410 |
| .040 | .374 | 72.2 | 40.5 | .79 | 10.72 | | 8.4 | 7.8 | 21.2 | .249 |
| .040 | .382 | 72.4 | 39.5 | .80 | 16.90 | | 6.6 | 6.1 | 21.1 | .157 |
| .044 | .417 | 72.6 | 37.2 | .78 | 25.39 | | 7.9 | 7.4 | 19.0 | .094 |
| | | | (60) | | | | | | | |
| .040 | .393 | 73.9 | 59.3 | .79 | 10.83 | (1.304) | 6.7 | 6.5 | 18.0 | .221 |
| .041 | .387 | 73.3 | 60.0 | .80 | 18.18 | | 7.8 | 7.5 | 19.2 | .141 |
| .041 | .397 | 74.4 | 59.4 | .80 | 28.06 | | 6.6 | 6.5 | 18.2 | .086 |
| .041 | .412 | 75.8 | 57.6 | .80 | 43.38 | | 7.4 | 7.5 | 15.3 | .047 |



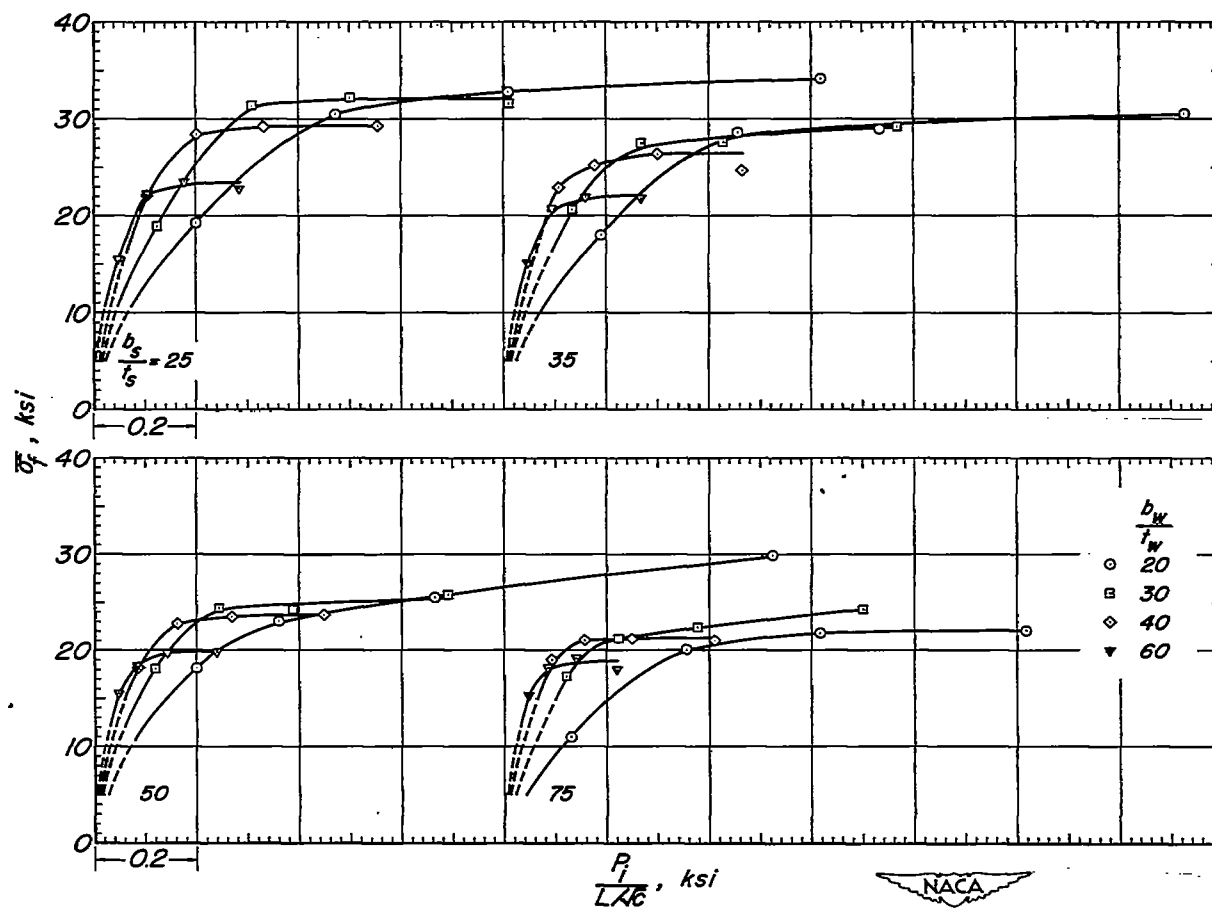


Figure 4.—Compressive strength of flat panels with hat-section stiffeners.

$$\frac{t_w}{t_s} = 0.39; \frac{b_H}{b_w} = 0.8.$$

TABLE 3

TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{t_w}{t_s} = 0.39$, $\frac{b_H}{b_w} = 1.0$

[Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------------------------|-----------------|------------------------|----------|---------------------------|------------------------------------|
| t_w (in.) | $\frac{t_w}{t_s}$ | $\frac{b_s}{t_s}$ | $\frac{b_w}{t_w}$ | $\frac{b_H}{b_w}$ | $\frac{L}{\sqrt{b_s t_s}}$ (in.) | $\frac{L}{t_s}$ | σ_{cr} (ksi) | | $\bar{\sigma}_r$ (ksi) | $\frac{P_1}{L\sqrt{b_s}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (0.39) | (25) | (20) | (1.0) | | | | | | |
| .040 | .374 | 23.3 | 20.1 | 1.00 | 3.54 | (1.351) | 32.2 | 28.8 | 34.5 | 1.341 |
| .040 | .374 | 23.4 | 20.2 | .99 | 5.70 | | 32.4 | 29.3 | 34.1 | .825 |
| .040 | .376 | 23.3 | 19.7 | 1.02 | 9.28 | | -- | -- | 30.0 | .445 |
| .040 | .383 | 23.7 | 19.8 | 1.02 | 13.91 | | -- | -- | 18.5 | .185 |
| .040 | .378 | 23.7 | 30.0 | .99 | 5.82 | (1.424) | 29.7 | 30.1 | 31.6 | .789 |
| .039 | .382 | 23.8 | 30.4 | 1.00 | 9.74 | | 30.4 | 30.8 | 31.1 | .464 |
| .039 | .380 | 24.1 | 30.7 | 1.00 | 15.55 | | -- | -- | 30.4 | .284 |
| .039 | .384 | 24.3 | 30.6 | .99 | 23.29 | | -- | -- | 21.8 | .136 |
| .040 | .388 | 24.2 | 40.3 | .99 | 8.31 | (1.486) | 24.7 | 24.6 | 28.4 | .519 |
| .040 | .388 | 24.0 | 39.8 | 1.00 | 13.88 | | -- | -- | 28.6 | .512 |
| .040 | .385 | 24.2 | 40.0 | 1.00 | 22.10 | | 22.9 | 22.9 | 25.5 | .175 |
| .039 | .386 | 24.4 | 40.5 | 1.00 | 33.15 | | -- | -- | 21.8 | .160 |
| .040 | .374 | 23.4 | 60.4 | 1.00 | 13.35 | (1.582) | 11.5 | 11.7 | 22.7 | .274 |
| .040 | .378 | 23.9 | 60.2 | 1.01 | 22.31 | | 11.5 | 11.9 | 22.2 | .160 |
| .040 | .374 | 23.6 | 60.2 | .99 | 35.62 | | 11.3 | 11.3 | 20.5 | .093 |
| .040 | .377 | 23.8 | 60.6 | 1.00 | 55.40 | | 10.4 | 10.6 | 14.4 | .044 |
| .039 | .386 | (35) | (20) | 1.00 | 3.18 | (1.281) | 25.1 | 25.1 | 32.7 | 1.345 |
| .039 | .384 | 35.2 | 20.6 | 1.00 | 5.44 | | 23.0 | 23.0 | 28.3 | .680 |
| .040 | .404 | 35.3 | 20.1 | 1.00 | 8.64 | | 23.2 | 23.6 | 28.8 | .436 |
| .039 | .376 | 35.5 | 20.0 | 1.01 | 13.03 | | -- | -- | 19.0 | .190 |
| .039 | .391 | 35.4 | 30.2 | 1.02 | 5.52 | (1.347) | 22.0 | 22.4 | 28.6 | .709 |
| .039 | .391 | 34.7 | 30.7 | .99 | 9.21 | | 23.5 | 23.2 | 27.5 | .410 |
| .039 | .390 | 34.7 | 30.8 | .98 | 14.64 | | 24.5 | 24.3 | 26.4 | .248 |
| .039 | .386 | 35.0 | 31.1 | 1.00 | 21.99 | | 20.9 | 20.7 | 21.3 | .133 |
| .039 | .378 | 34.4 | 41.2 | .98 | 7.90 | (1.403) | 24.5 | 25.1 | 25.6 | .464 |
| .039 | .380 | 33.8 | 40.6 | 1.00 | 15.19 | | 23.0 | 23.6 | 24.9 | .270 |
| .039 | .372 | 33.7 | 41.8 | 1.00 | 21.06 | | 23.2 | 24.3 | 24.4 | .166 |
| .040 | .381 | 33.6 | 40.3 | 1.00 | 31.58 | | 18.4 | 18.6 | 19.7 | .089 |
| .039 | .390 | 34.6 | 60.8 | 1.00 | 12.82 | (1.495) | 12.1 | 12.6 | 21.0 | .250 |
| .039 | .389 | 33.8 | 61.6 | 1.00 | 21.44 | | 12.1 | 12.6 | 20.3 | .144 |
| .039 | .382 | 33.8 | 60.6 | 1.00 | 34.31 | | 12.6 | 13.2 | 19.6 | .087 |
| .039 | .381 | 34.2 | 61.4 | 1.00 | 51.56 | | 10.3 | 10.8 | 14.6 | .043 |
| .039 | .396 | (50) | (20) | 1.02 | 3.00 | (1.217) | 17.9 | 18.6 | 28.3 | 1.173 |
| .039 | .382 | 50.9 | 20.2 | .98 | 4.94 | | 17.9 | 17.2 | 25.5 | .642 |
| .040 | .402 | 50.4 | 20.0 | 1.00 | 7.91 | | 14.9 | 15.2 | 24.7 | .387 |
| .040 | .404 | 51.0 | 20.2 | .99 | 11.82 | | 13.0 | 13.6 | 19.3 | .203 |
| .039 | .400 | 51.4 | 30.4 | 1.00 | 5.13 | (1.272) | 16.3 | 17.2 | 24.7 | .624 |
| .039 | .400 | 51.2 | 30.6 | 1.00 | 8.51 | | 14.5 | 15.2 | 24.1 | .367 |
| .040 | .402 | 51.1 | 30.4 | 1.00 | 13.61 | | 16.4 | 17.1 | 24.3 | .231 |
| .039 | .379 | 48.7 | 31.1 | 1.00 | 20.40 | | 16.2 | 15.4 | 21.0 | .134 |
| .040 | .404 | 51.2 | 40.3 | 1.00 | 7.41 | (1.320) | 13.9 | 14.6 | 23.4 | .424 |
| .039 | .402 | 51.4 | 40.2 | 1.00 | 12.27 | | 16.5 | 17.5 | 22.4 | .245 |
| .039 | .399 | 51.1 | 40.2 | 1.02 | 19.70 | | 15.8 | 14.4 | 22.7 | .155 |
| .039 | .393 | 51.0 | 40.8 | .99 | 29.54 | | 14.0 | 14.6 | 18.4 | .084 |
| .040 | .388 | 49.4 | 60.4 | 1.00 | 12.24 | (1.403) | 11.6 | 11.8 | 18.9 | .221 |
| .040 | .388 | 49.4 | 60.7 | 1.00 | 20.36 | | 10.9 | 11.2 | 18.5 | .130 |
| .040 | .385 | 49.2 | 60.6 | 1.00 | 32.53 | | 10.0 | 10.4 | 16.4 | .072 |
| .039 | .384 | 49.4 | 60.8 | 1.00 | 48.77 | | 10.8 | 11.2 | 14.9 | .044 |
| .039 | .380 | (75) | (20) | .99 | 2.68 | (1.157) | 13.4 | 12.9 | 22.2 | .978 |
| .039 | .380 | 75.6 | 20.4 | .99 | 4.38 | | 9.4 | 9.2 | 24.1 | .650 |
| .039 | .380 | 74.1 | 20.6 | 1.00 | 7.09 | | 9.0 | 8.7 | 20.0 | .534 |
| .039 | .382 | 73.7 | 20.2 | .99 | 10.59 | | 8.8 | 8.5 | 11.4 | .127 |
| .040 | .382 | 72.4 | 29.6 | .96 | 4.54 | (1.200) | 10.5 | 9.8 | 23.9 | .643 |
| .040 | .383 | 72.9 | 30.2 | .99 | 7.60 | | 9.4 | 8.9 | 22.1 | .356 |
| .040 | .381 | 73.4 | 30.2 | 1.00 | 12.17 | | 7.3 | 7.0 | 21.0 | .212 |
| .040 | .378 | 73.0 | 30.8 | .99 | 18.21 | | 6.8 | 6.4 | 18.0 | .121 |
| .039 | .390 | 75.2 | 40.6 | .99 | 6.70 | (1.238) | 8.8 | 8.9 | 20.8 | .392 |
| .044 | .418 | 72.4 | 36.5 | .99 | 11.16 | | 8.8 | 9.2 | 22.1 | .250 |
| .044 | .417 | 72.8 | 37.4 | .98 | 17.70 | | 7.9 | 7.5 | 21.6 | .154 |
| .044 | .450 | 77.8 | 36.5 | 1.00 | 26.80 | | 8.0 | 8.7 | 18.7 | .088 |
| .040 | .379 | 73.2 | 61.2 | 1.00 | 11.34 | (1.309) | 8.8 | 8.3 | 18.5 | .218 |
| .040 | .360 | 72.1 | 60.0 | 1.00 | 18.87 | | 6.2 | 6.4 | 18.4 | .130 |
| .040 | .398 | 76.8 | 60.5 | 1.00 | 30.15 | | 7.8 | 8.2 | 17.6 | .078 |
| .040 | .400 | 76.4 | 59.8 | 1.00 | 45.19 | | 7.9 | 8.2 | 14.2 | .042 |

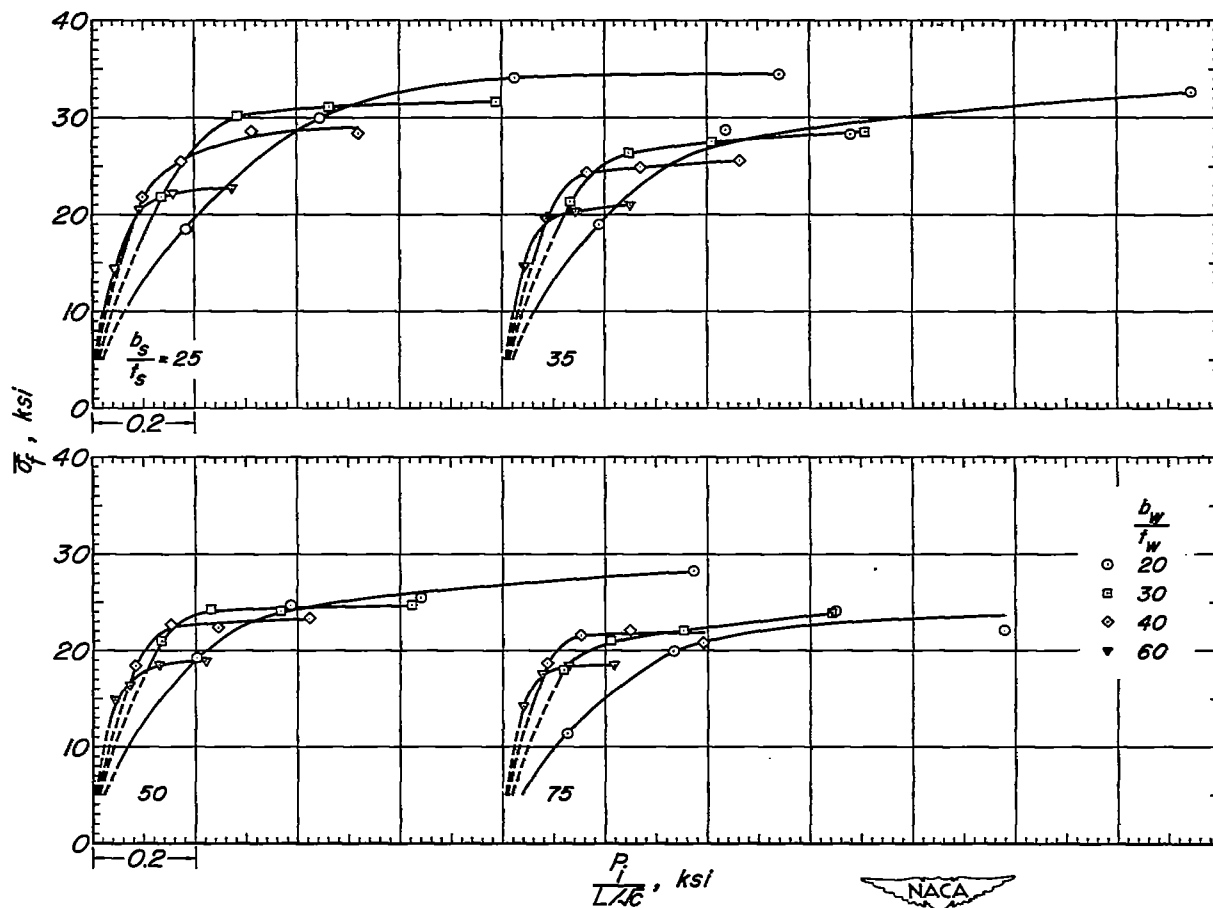


TABLE 4
TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{t_w}{t_s} = 0.39$, $\frac{b_H}{b_W} = 1.2$
[Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------------------|-----------------|------------------------|----------|---------------------------|-----------------------------------|
| t_w (in.) | $\frac{t_w}{t_s}$ | $\frac{b_s}{t_s}$ | $\frac{b_w}{t_w}$ | $\frac{b_H}{b_W}$ | $\frac{L}{\sqrt{c}}$ (in.) | $\frac{L}{t_s}$ | σ_{cr} (ksi) | | $\bar{\sigma}_r$ (ksi) | $\frac{P_t}{L/\sqrt{c}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (0.39) | (25) | (20) | (1.2) | | | | | | |
| .040 | .376 | 23.5 | 20.1 | 1.20 | 3.66 | (1.353) | 31.8 | 32.8 | 33.8 | 1.274 |
| .040 | .376 | 23.0 | 20.0 | 1.21 | 6.06 | | 30.3 | 26.5 | 32.6 | .743 |
| .040 | .376 | 23.3 | 19.8 | 1.20 | 9.63 | | 29.4 | 26.4 | 30.7 | .440 |
| .040 | .378 | 23.4 | 20.2 | 1.19 | 14.51 | | -- | -- | 19.8 | .188 |
| .040 | .377 | 23.8 | (30) | | | | | | | |
| .039 | .384 | 24.3 | 30.4 | 1.19 | 5.95 | (1.423) | 28.6 | 26.5 | 30.7 | .749 |
| .039 | .382 | 24.1 | 30.2 | 1.20 | 10.07 | | 28.5 | 23.6 | 29.9 | .431 |
| .039 | .384 | 24.7 | 31.0 | 1.19 | 16.10 | | -- | -- | 29.7 | .268 |
| | | | | | 24.10 | | 20.4 | 21.7 | 20.9 | .126 |
| .040 | .380 | 24.0 | (40) | | | | | | | |
| .040 | .382 | 23.6 | 40.2 | 1.19 | 8.57 | (1.479) | 19.5 | 19.4 | 27.8 | .490 |
| .039 | .378 | 23.6 | 40.2 | 1.20 | 14.25 | | 20.6 | 20.8 | 27.4 | .290 |
| .039 | .381 | 24.4 | 40.6 | 1.20 | 22.79 | | 23.1 | 24.1 | 26.4 | .175 |
| | | | | | 34.14 | | 18.9 | 19.5 | 19.6 | .087 |
| .039 | .371 | 23.6 | (60) | | | | | | | |
| .040 | .376 | 23.4 | 61.3 | 1.20 | 13.17 | (1.568) | 8.0 | 8.4 | 20.3 | .246 |
| .039 | .390 | 25.0 | 61.0 | 1.22 | 22.77 | | 7.1 | 7.3 | 21.3 | .150 |
| .039 | .372 | 24.0 | 61.8 | 1.20 | 36.41 | | 8.8 | 9.2 | 19.6 | .086 |
| | | | | | 54.69 | | 8.8 | 9.3 | 14.0 | .041 |
| .039 | .388 | (35) | (20) | | | | | | | |
| .039 | .388 | 35.4 | 20.4 | 1.20 | 3.34 | (1.286) | 26.9 | 29.5 | 30.1 | 1.182 |
| .039 | .387 | 34.9 | 20.5 | 1.22 | 5.61 | | 24.2 | 24.0 | 29.7 | .685 |
| .039 | .389 | 35.0 | 20.3 | 1.20 | 9.05 | | 23.2 | 23.3 | 26.1 | .382 |
| | | | | | 13.55 | | -- | -- | 19.8 | .191 |
| .039 | .391 | 35.0 | (30) | | | | | | | |
| .039 | .392 | 35.0 | 30.4 | 1.22 | 5.68 | (1.348) | 22.5 | 22.7 | 27.3 | .660 |
| .039 | .391 | 34.9 | 30.5 | 1.18 | 9.46 | | 24.2 | 24.3 | 24.8 | .390 |
| .039 | .386 | 34.4 | 30.7 | 1.18 | 15.17 | | 23.5 | 23.5 | 26.0 | .236 |
| | | | | | 22.81 | | 20.0 | 19.3 | 20.9 | .126 |
| .039 | .378 | 33.4 | (40) | | | | | | | |
| .040 | .390 | 34.7 | 40.8 | 1.20 | 8.23 | (1.402) | 17.7 | 18.4 | 24.9 | .433 |
| .038 | .389 | 34.7 | 40.2 | 1.20 | 13.56 | | 21.8 | 22.0 | 24.3 | .282 |
| .040 | .386 | 33.9 | 41.6 | 1.17 | 21.69 | | 20.1 | 20.8 | 24.1 | .159 |
| | | | | | 32.58 | | 16.0 | 16.0 | 17.8 | .078 |
| .040 | .383 | 33.7 | (60) | | | | | | | |
| .040 | .393 | 33.7 | 60.4 | 1.20 | 13.20 | (1.487) | 8.6 | 8.7 | 20.1 | .231 |
| .040 | .394 | 33.6 | 59.8 | 1.20 | 21.93 | | 9.2 | 9.9 | 19.3 | .134 |
| .039 | .391 | 33.2 | 60.0 | 1.22 | 35.20 | | 8.4 | 8.7 | 19.6 | .084 |
| | | | | | 52.78 | | 8.2 | 8.6 | 14.0 | .040 |
| .039 | .384 | (50) | (20) | | | | | | | |
| .039 | .385 | 50.5 | 20.3 | 1.20 | 3.15 | (1.221) | 20.2 | 20.6 | 27.0 | 1.067 |
| .040 | .388 | 49.1 | 20.4 | 1.20 | 5.14 | | 17.9 | 17.3 | 25.1 | .609 |
| .039 | .392 | 50.8 | 20.4 | 1.18 | 8.28 | | 14.4 | 14.8 | 23.4 | .352 |
| | | | | | 12.41 | | 16.0 | 16.0 | 20.0 | .201 |
| .039 | .384 | (30) | (30) | | | | | | | |
| .040 | .384 | 49.8 | 30.9 | 1.18 | 5.30 | (1.276) | 16.3 | 16.1 | 24.8 | .608 |
| .040 | .380 | 49.2 | 30.3 | 1.20 | 8.86 | | 16.0 | 15.5 | 23.2 | .341 |
| .039 | .384 | 48.8 | 30.4 | 1.20 | 14.11 | | 14.4 | 15.4 | 23.6 | .218 |
| | | | | | 21.15 | | 15.8 | 15.1 | 21.8 | .134 |
| .040 | .392 | (40) | (40) | | | | | | | |
| .039 | .380 | 49.7 | 40.3 | 1.20 | 7.65 | (1.322) | 14.0 | 14.2 | 21.6 | .382 |
| .040 | .384 | 49.0 | 41.0 | 1.20 | 12.78 | | 15.7 | 15.1 | 21.7 | .229 |
| .039 | .378 | 48.8 | 40.4 | 1.20 | 20.35 | | 15.0 | 14.3 | 21.1 | .140 |
| | | | | | 30.56 | | 15.0 | 14.2 | 16.4 | .072 |
| .040 | .386 | (60) | (60) | | | | | | | |
| .040 | .386 | 48.6 | 60.0 | 1.21 | 12.58 | (1.402) | 7.4 | 7.5 | 18.2 | .206 |
| .039 | .380 | 48.8 | 60.8 | 1.20 | 20.91 | | 8.0 | 8.2 | 17.6 | .120 |
| .039 | .382 | 49.0 | 60.8 | 1.21 | 33.52 | | 7.8 | 8.2 | 16.8 | .072 |
| | | | | | 50.23 | | 8.0 | 8.4 | 14.0 | .040 |
| .039 | .382 | (75) | (20) | | | | | | | |
| .040 | .385 | 73.4 | 20.4 | 1.21 | 2.83 | (1.161) | 14.0 | 13.4 | 21.0 | .877 |
| .040 | .382 | 73.5 | 20.0 | 1.21 | 4.65 | | 11.5 | 11.1 | 22.0 | .562 |
| .040 | .393 | 73.0 | 20.0 | 1.20 | 7.36 | | 9.9 | 9.4 | 20.2 | .336 |
| | | | | | 11.06 | | 9.9 | 9.4 | 16.2 | .173 |
| .040 | .379 | (30) | (30) | | | | | | | |
| .040 | .378 | 72.7 | 29.6 | 1.21 | 4.79 | (1.204) | 11.2 | 10.6 | 22.4 | .574 |
| .040 | .385 | 72.6 | 30.1 | 1.20 | 7.88 | | 9.1 | 8.6 | 22.2 | .351 |
| .039 | .374 | 74.0 | 30.8 | 1.18 | 12.69 | | 8.6 | 8.1 | 19.7 | .191 |
| | | | | | 19.06 | | 8.5 | 8.1 | 17.9 | .115 |
| .044 | .438 | (40) | (40) | | | | | | | |
| .045 | .436 | 75.4 | 36.4 | 1.19 | 6.99 | (1.243) | 7.9 | 8.0 | 21.4 | .387 |
| .045 | .448 | 74.4 | 36.0 | 1.19 | 11.61 | | 8.1 | 8.0 | 21.8 | .239 |
| .044 | .454 | 75.2 | 35.4 | 1.19 | 18.62 | | 7.0 | 7.0 | 21.0 | .143 |
| | | | | | 27.73 | | 7.4 | 7.9 | 18.2 | .083 |
| .041 | .385 | (60) | (60) | | | | | | | |
| .040 | .382 | 72.8 | 58.2 | 1.20 | 11.70 | (1.311) | 6.4 | 6.0 | 17.1 | .196 |
| .041 | .385 | 72.4 | 59.2 | 1.20 | 19.45 | | 7.4 | 6.9 | 18.6 | .128 |
| .041 | .385 | 72.8 | 58.9 | 1.20 | 31.15 | | 7.8 | 7.3 | 17.3 | .074 |
| .041 | .404 | 76.3 | 58.8 | 1.20 | 46.66 | | 7.6 | 7.8 | 13.9 | .040 |

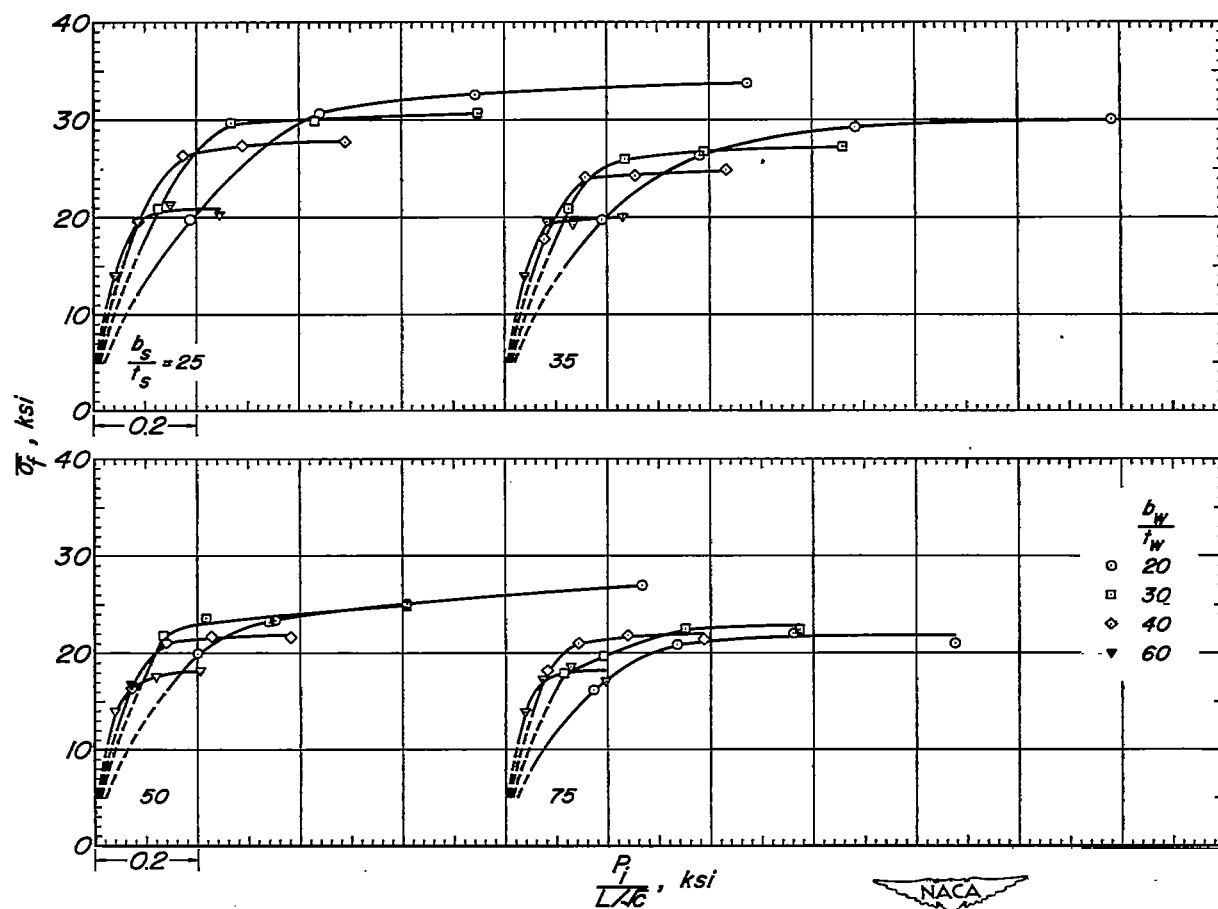


Figure 6.—Compressive strength of flat panels with hat-section stiffeners.

$$\frac{t_w}{t_s} = 0.39; \frac{b_H}{b_w} = 1.2.$$

TABLE 5

TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{t_w}{t_s} = 0.65$, $\frac{b_w}{b_s} = 0.6$
 [Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|--------------|-------------------|-------------------|--------------------------|-----------------|------------------------|----------|---------------------|------------------------------|
| t_w (in.) | $\frac{t_w}{t_s}$ | b_s in. | $\frac{b_w}{t_s}$ | $\frac{b_w}{b_s}$ | $\frac{L}{Y_C}$ (in.) | $\frac{L}{b_s}$ | σ_{or} (ksi) | | σ_r (ksi) | $\frac{P_1}{L/b_s}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (0.65) | (25) | (20) | (0.6) | | | | | | |
| .039 | .632 | 26.4 | 20.2 | .58 | 2.48 | (1.721) | 32.4 | 35.0 | 36.7 | 1.626 |
| .039 | .625 | 26.0 | 20.4 | .59 | 4.99 | | 32.7 | 34.6 | 35.8 | .790 |
| .039 | .624 | 26.1 | 20.5 | .60 | 7.51 | | -- | -- | 34.8 | .509 |
| .039 | .623 | 26.0 | 20.9 | .60 | 12.52 | | -- | -- | 27.1 | .238 |
| .044 | .690 | 25.7 | 27.1 | .63 | 4.24 | (1.880) | 34.8 | 36.1 | 36.9 | 1.047 |
| .040 | .638 | 26.2 | 30.2 | .61 | 8.27 | | 30.7 | 33.1 | 34.3 | .493 |
| .039 | .615 | 25.4 | 30.6 | .58 | 12.58 | | 32.4 | 33.2 | 33.7 | .322 |
| .040 | .612 | 24.6 | 29.9 | .62 | 20.85 | | -- | -- | 26.5 | .153 |
| .039 | .638 | 26.5 | 40.3 | .60 | 5.90 | (2.016) | 29.6 | 30.0 | 31.0 | .678 |
| .040 | .634 | 25.8 | 40.0 | .62 | 11.72 | | 27.5 | 27.6 | 30.8 | .339 |
| .039 | .623 | 26.1 | 41.1 | .61 | 17.69 | | 28.1 | 29.4 | 30.0 | .219 |
| .040 | .620 | 25.4 | 40.2 | .62 | 29.32 | | -- | -- | 26.5 | .117 |
| .039 | .623 | 25.8 | 60.3 | .60 | 9.31 | (2.235) | 15.5 | 16.0 | 24.5 | .376 |
| .040 | .625 | 25.4 | 60.1 | .59 | 18.56 | | 14.0 | 14.0 | 24.4 | .188 |
| .041 | .630 | 24.6 | 57.9 | .60 | 27.87 | | 14.8 | 13.8 | 24.5 | .126 |
| .039 | .626 | 25.9 | 60.8 | .60 | 46.43 | | 15.2 | 15.6 | 23.7 | .073 |
| .041 | .652 | 35.6 | 19.3 | .54 | 2.40 | (1.585) | 25.9 | 26.6 | 34.3 | 1.448 |
| .040 | .634 | 35.5 | 19.6 | .60 | 4.81 | | 27.4 | 28.0 | 33.2 | .701 |
| .042 | .681 | 36.0 | 18.4 | .64 | 7.14 | | 26.6 | 27.8 | 34.1 | .485 |
| .040 | .644 | 36.8 | 19.6 | .59 | 11.91 | | -- | -- | 26.0 | .222 |
| .041 | .656 | 36.1 | 28.5 | .59 | 3.74 | (1.725) | 26.4 | 27.8 | 33.4 | .986 |
| .040 | .651 | 36.7 | 30.1 | .62 | 8.04 | | 24.1 | 26.1 | 31.2 | .428 |
| .040 | .640 | 36.2 | 30.0 | .60 | 12.02 | | 22.6 | 24.1 | 31.6 | .290 |
| .040 | .654 | 36.9 | 29.6 | .60 | 20.13 | | -- | -- | 24.9 | .137 |
| .040 | .656 | 36.8 | 39.8 | .58 | 5.76 | (1.848) | 22.2 | 24.2 | 28.5 | .585 |
| .039 | .644 | 37.0 | 39.6 | .62 | 11.44 | | 21.0 | 23.4 | 27.4 | .483 |
| .040 | .648 | 36.4 | 39.6 | .61 | 17.21 | | 22.4 | 24.2 | 28.1 | .193 |
| .039 | .636 | 35.9 | 39.7 | .61 | 28.56 | | 23.5 | 24.5 | 26.1 | .108 |
| .040 | .656 | 36.6 | 59.2 | .60 | 9.20 | (2.053) | 15.3 | 14.9 | 23.1 | .330 |
| .043 | .684 | 36.2 | 55.0 | .60 | 18.20 | | 16.2 | 14.0 | 24.4 | .176 |
| .040 | .638 | 35.4 | 60.0 | .59 | 27.40 | | 13.7 | 13.6 | 22.9 | .110 |
| .043 | .696 | 35.8 | 55.2 | .60 | 45.57 | | 16.8 | 14.3 | 22.2 | .064 |
| .040 | .646 | 50.8 | 19.8 | .60 | 3.80 | (1.455) | 18.5 | 19.1 | 30.5 | .748 |
| .042 | .667 | 50.8 | 19.2 | .60 | 7.67 | | 16.0 | 16.5 | 30.2 | .366 |
| .041 | .656 | 50.6 | 19.3 | .58 | 11.60 | | 15.2 | 15.5 | 22.6 | .181 |
| .041 | .651 | 50.9 | 19.2 | .62 | 19.35 | | -- | -- | 6.1 | .029 |
| .042 | .664 | 51.0 | 28.6 | .64 | 4.86 | (1.573) | 17.2 | 18.0 | 30.3 | .628 |
| .042 | .660 | 50.7 | 28.4 | .64 | 9.72 | | 15.9 | 16.4 | 30.7 | .311 |
| .040 | .631 | 50.7 | 30.0 | .60 | 14.59 | | 17.7 | 18.2 | 27.8 | .192 |
| .042 | .658 | 50.5 | 28.8 | .61 | 24.28 | | 18.5 | 18.9 | 19.7 | .082 |
| .043 | .668 | 50.0 | 37.4 | .60 | 6.21 | (1.679) | 18.0 | 18.0 | 28.0 | .485 |
| .043 | .666 | 50.1 | 37.7 | .59 | 12.47 | | 15.8 | 15.9 | 28.2 | .243 |
| .043 | .659 | 48.8 | 37.4 | .62 | 18.66 | | 17.3 | 16.4 | 27.9 | .161 |
| .042 | .644 | 49.2 | 38.4 | .60 | 31.14 | | 19.3 | 18.7 | 21.6 | .075 |
| .042 | .658 | 49.8 | 56.8 | .60 | 8.36 | (1.863) | 16.2 | 14.6 | 23.4 | .333 |
| .042 | .648 | 48.8 | 57.4 | .60 | 18.24 | | 15.0 | 13.7 | 22.8 | .146 |
| .043 | .661 | 49.0 | 56.4 | .60 | 27.91 | | 15.5 | 15.7 | 23.6 | .101 |
| .041 | .653 | 50.8 | 58.6 | .60 | 46.47 | | 14.2 | 15.6 | 21.1 | .054 |
| .039 | .620 | 76.4 | 20.2 | .58 | 3.06 | (1.333) | 10.5 | 10.9 | 25.8 | .718 |
| .039 | .622 | 76.8 | 20.3 | .58 | 5.12 | | 8.2 | 8.6 | 25.1 | .418 |
| .040 | .630 | 75.6 | 19.6 | .61 | 8.17 | | 8.6 | 8.8 | 24.1 | .252 |
| .045 | .723 | 76.8 | 17.6 | .61 | 12.23 | | 9.9 | 10.4 | 20.6 | .143 |
| .040 | .628 | 74.6 | 29.7 | .60 | 5.32 | (1.425) | 8.3 | 8.2 | 24.9 | .428 |
| .038 | .606 | 75.8 | 30.4 | .60 | 8.84 | | 8.8 | 10.0 | 25.0 | .258 |
| .040 | .614 | 74.8 | 30.4 | .60 | 14.15 | | 9.8 | 8.7 | 24.1 | .153 |
| .039 | .600 | 74.3 | 31.0 | .58 | 21.24 | | 9.0 | 6.9 | 19.2 | .085 |
| .040 | .624 | 75.4 | 40.3 | .59 | 7.69 | (1.510) | 9.0 | 9.1 | 23.6 | .297 |
| .040 | .624 | 75.2 | 40.8 | .58 | 12.88 | | 9.9 | 9.7 | 23.9 | .179 |
| .040 | .624 | 74.8 | 40.4 | .57 | 20.59 | | 9.7 | 9.7 | 23.4 | .110 |
| .039 | .612 | 75.0 | 40.8 | .60 | 30.86 | | 8.9 | 8.9 | 20.5 | .084 |
| .040 | .633 | 76.2 | 60.2 | .60 | 12.70 | (1.663) | 9.8 | 10.1 | 20.4 | .171 |
| .039 | .630 | 76.2 | 60.6 | .60 | 21.28 | | 9.9 | 10.3 | 20.0 | .100 |
| .041 | .632 | 74.2 | 58.7 | .62 | 35.95 | | 9.2 | 9.0 | 20.2 | .063 |
| .040 | .622 | 75.0 | 60.0 | .66 | 50.81 | | 10.4 | 10.4 | 17.6 | .037 |

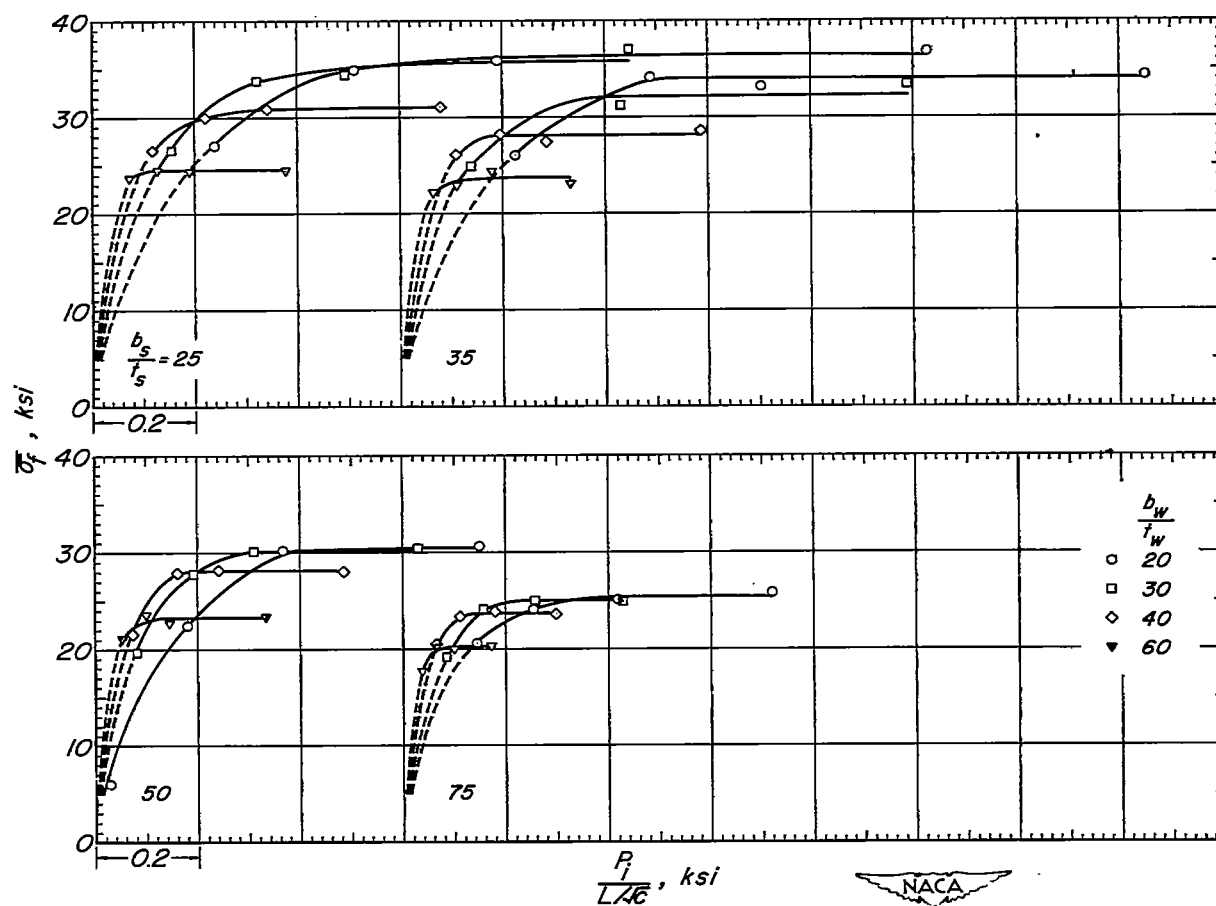


Figure 7.—Compressive strength of flat panels with hat-section stiffeners.

$$\frac{t_w}{t_s} = 0.63; \frac{b_H}{b_w} = 0.6.$$

TABLE 6

TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{t_w}{t_s} = 0.63$, $\frac{b_H}{b_W} = 0.8$

[Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|--------------------------|-----------------|---------------------------|----------|---------------------|------------------------------------|
| t_w (in.) | $\frac{t_w}{t_s}$ | $\frac{b_s}{t_s}$ | $\frac{b_w}{t_w}$ | $\frac{b_H}{b_W}$ | $\frac{L}{V_0}$ (in.) | $\frac{t}{t_s}$ | $\bar{\sigma}_r$ (ksi) | | σ_r (ksi) | $\frac{P_r}{L\sqrt{V_0}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (0.63) | (25) | (20) | (0.8) | | | | | | |
| .040 | .634 | 25.0 | 20.4 | .78 | 2.62 | (1.715) | 34.2 | 36.1 | 36.9 | 1.548 |
| .039 | .631 | 25.6 | 20.2 | .80 | 5.32 | | 33.4 | 34.4 | 36.0 | .743 |
| .039 | .628 | 25.7 | 20.5 | .78 | 7.93 | | -- | -- | 34.9 | .485 |
| .039 | .629 | 25.9 | 20.5 | .78 | 17.22 | | -- | -- | 27.0 | .221 |
| .044 | .708 | 26.6 | 27.2 | .78 | 4.35 | (1.861) | 32.6 | 35.5 | 35.8 | .981 |
| .040 | .637 | 26.2 | 30.2 | .79 | 8.88 | | 30.8 | 33.2 | 33.5 | .460 |
| .039 | .637 | 26.6 | 30.6 | .78 | 13.09 | | 30.2 | 33.2 | 33.3 | .303 |
| .040 | .640 | 26.5 | 30.2 | .82 | 21.80 | | -- | -- | 23.8 | .130 |
| .041 | .670 | 26.6 | 39.0 | .80 | 6.07 | (1.981) | 29.3 | 28.1 | 30.5 | .637 |
| .041 | .662 | 26.3 | 38.6 | .81 | 12.25 | | 29.3 | 27.7 | 30.5 | .316 |
| .041 | .652 | 26.0 | 39.0 | .80 | 18.31 | | -- | -- | 29.5 | .204 |
| .040 | .646 | 26.2 | 40.4 | .78 | 30.49 | | -- | -- | 27.2 | .113 |
| .040 | .628 | 25.8 | 60.2 | .80 | 9.62 | (2.165) | 13.2 | 13.3 | 22.8 | .329 |
| .039 | .610 | 25.1 | 61.6 | .80 | 19.23 | | 13.6 | 14.4 | 22.3 | .161 |
| .040 | .626 | 25.4 | 59.7 | .80 | 26.70 | | 14.4 | 14.1 | 22.3 | .107 |
| .039 | .626 | 25.2 | 60.8 | .80 | 47.90 | | 13.8 | 14.3 | 20.7 | .060 |
| .044 | .714 | 36.0 | 17.0 | .86 | 2.45 | (1.586) | -- | -- | 34.8 | 1.441 |
| .041 | .647 | 36.0 | 19.3 | .82 | 4.97 | | 24.0 | 25.4 | 33.3 | .680 |
| .040 | .644 | 35.2 | 19.3 | .80 | 7.99 | | 25.2 | 25.5 | 32.8 | .439 |
| .040 | .641 | 35.7 | 19.8 | .81 | 12.56 | | -- | -- | 26.4 | .213 |
| .041 | .655 | 36.2 | 29.4 | .79 | 4.24 | (1.719) | 25.2 | 26.6 | 32.8 | .849 |
| .041 | .679 | 36.8 | 28.4 | .80 | 8.42 | | 23.0 | 25.1 | 32.3 | .421 |
| .041 | .657 | 36.5 | 29.0 | .80 | 12.58 | | 22.8 | 24.7 | 31.0 | .271 |
| .040 | .652 | 36.7 | 29.4 | .81 | 21.02 | | 24.3 | 26.2 | 25.4 | .132 |
| .042 | .686 | 37.2 | 37.5 | .80 | 5.96 | (1.831) | 22.2 | 24.6 | 29.0 | .570 |
| .041 | .666 | 36.6 | 38.2 | .80 | 11.86 | | 24.5 | 26.4 | 28.3 | .280 |
| .039 | .642 | 35.3 | 40.8 | .80 | 17.84 | | 21.3 | 21.9 | 27.1 | .178 |
| .040 | .644 | 36.6 | 39.2 | .80 | 29.90 | | 23.5 | 23.4 | 25.9 | .101 |
| .044 | .703 | 36.0 | 54.5 | .80 | 9.43 | (2.010) | 17.0 | 14.0 | 23.4 | .319 |
| .043 | .689 | 36.0 | 53.3 | .78 | 18.86 | | 16.6 | 14.1 | 23.0 | .157 |
| .043 | .693 | 36.1 | 55.2 | .80 | 28.24 | | 16.1 | 15.7 | 22.6 | .103 |
| .043 | .701 | 35.8 | 56.4 | .80 | 47.24 | | 16.1 | 14.2 | 20.7 | .056 |
| .041 | .637 | 50.5 | 19.6 | .79 | 3.88 | (1.461) | 14.8 | 14.1 | 30.9 | .745 |
| .042 | .626 | 50.7 | 19.2 | .79 | 7.88 | | 18.8 | 17.2 | 30.1 | .358 |
| .041 | .650 | 50.2 | 19.4 | .80 | 11.87 | | 17.6 | 17.7 | 24.7 | .194 |
| .041 | .656 | 50.2 | 19.5 | .78 | 19.73 | | -- | -- | 10.2 | .048 |
| .042 | .635 | 49.4 | 28.6 | .82 | 5.08 | (1.575) | 18.7 | 18.2 | 30.7 | .608 |
| .041 | .658 | 50.0 | 29.3 | .80 | 10.07 | | 19.2 | 19.2 | 29.1 | .291 |
| .041 | .645 | 50.2 | 28.6 | .81 | 15.15 | | 19.1 | 19.3 | 28.8 | .182 |
| .042 | .643 | 49.5 | 29.0 | .79 | 25.20 | | 18.8 | 18.5 | 20.1 | .090 |
| .042 | .638 | 48.6 | 38.2 | .80 | 6.45 | (1.676) | 15.1 | 14.2 | 27.2 | .452 |
| .041 | .634 | 49.4 | 39.2 | .80 | 12.92 | | 15.7 | 15.3 | 27.3 | .227 |
| .041 | .652 | 48.8 | 35.1 | .80 | 19.54 | | 15.5 | 16.8 | 24.6 | .168 |
| .042 | .644 | 49.4 | 38.4 | .80 | 32.14 | | 18.4 | 18.0 | 24.2 | .081 |
| .043 | .680 | 50.6 | 55.8 | .81 | 9.65 | (1.844) | 14.0 | 12.1 | 21.7 | .265 |
| .041 | .629 | 48.8 | 58.4 | .80 | 19.26 | | 14.1 | 13.4 | 21.5 | .132 |
| .043 | .683 | 50.4 | 55.4 | .80 | 28.85 | | 15.0 | 13.8 | 21.8 | .089 |
| .042 | .646 | 50.8 | 57.6 | .82 | 48.05 | | 14.8 | 13.6 | 20.2 | .050 |
| .042 | .658 | 75.1 | 19.0 | .81 | 3.30 | (1.340) | 9.7 | 9.7 | 26.1 | .679 |
| .039 | .611 | 75.4 | 20.2 | .80 | 5.36 | | 11.5 | 11.6 | 24.3 | .388 |
| .037 | .584 | 72.6 | 21.6 | .80 | 8.70 | | 9.2 | 9.4 | 23.2 | .231 |
| .038 | .602 | 78.3 | 20.8 | .82 | 13.06 | | 9.1 | 9.4 | 18.5 | .121 |
| .039 | .596 | 74.2 | 31.2 | .78 | 5.61 | (1.433) | -- | -- | 25.0 | .408 |
| .039 | .600 | 74.2 | 30.7 | .80 | 9.39 | | 9.8 | 9.6 | 25.9 | .249 |
| .040 | .613 | 74.1 | 31.8 | .76 | 14.99 | | 10.2 | 10.0 | 24.8 | .152 |
| .039 | .603 | 74.0 | 30.6 | .80 | 22.40 | | 9.3 | 9.1 | 19.5 | .080 |
| .040 | .632 | 76.6 | 40.2 | .80 | 8.01 | (1.516) | 10.1 | 10.6 | 23.6 | .286 |
| .040 | .620 | 74.0 | 40.0 | .78 | 13.48 | | 9.4 | 9.2 | 23.0 | .165 |
| .040 | .633 | 76.2 | 40.3 | .78 | 21.50 | | 9.5 | 9.8 | 23.4 | .106 |
| .040 | .636 | 75.9 | 39.7 | .80 | 32.17 | | 8.7 | 8.9 | 21.7 | .066 |
| .040 | .635 | 76.6 | 61.0 | .80 | 13.13 | (1.661) | 10.2 | 10.6 | 19.4 | .157 |
| .039 | .613 | 75.0 | 60.9 | .80 | 22.06 | | 9.4 | 9.4 | 19.0 | .091 |
| .039 | .612 | 74.8 | 61.2 | .79 | 35.31 | | 8.7 | 8.7 | 19.1 | .058 |
| .040 | .623 | 75.8 | 60.0 | .82 | 52.93 | | 9.0 | 9.2 | 16.3 | .033 |

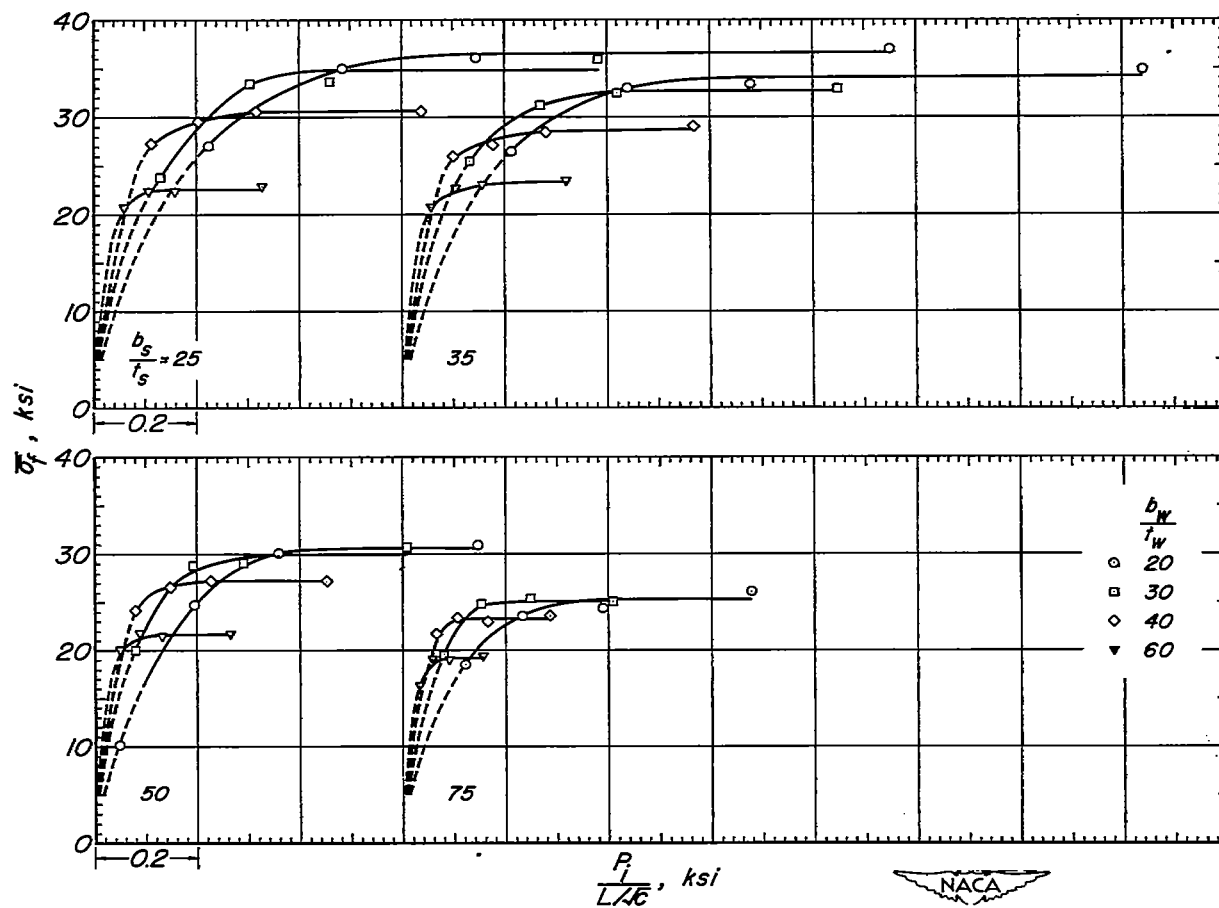


Figure 8.—Compressive strength of flat panels with hat-section stiffeners.

$$\frac{t_w}{t_s} = 0.63; \frac{b_H}{b_w} = 0.8.$$

TABLE 7

TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{t_W}{t_S} = 0.63$, $\frac{b_H}{b_W} = 1.0$
 [Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|--------------------------|-----------------|------------------------|----------|---------------------|------------------------------|
| t_W (in.) | $\frac{t_W}{t_S}$ | $\frac{b_S}{t_S}$ | $\frac{b_W}{t_W}$ | $\frac{b_H}{b_W}$ | $\frac{L}{a_0}$ (in.) | $\frac{L}{t_S}$ | σ_{or} (ksi) | | σ_f (ksi) | $\frac{P_1}{L/t_S}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (0.63) | (25) | (20) | (1.0) | | | | | | |
| .040 | .640 | 26.4 | 20.2 | 1.00 | 2.78 | (1.711) | 34.0 | 36.6 | 35.8 | 1.407 |
| .039 | .629 | 25.8 | 20.4 | 1.00 | 5.53 | | 33.0 | 34.7 | 35.2 | .698 |
| .039 | .632 | 26.2 | 20.5 | .99 | 8.28 | | 31.6 | 34.0 | 33.4 | .442 |
| .039 | .643 | 26.4 | 20.4 | .98 | 13.81 | | -- | -- | 27.7 | .220 |
| .040 | .642 | 26.1 | 30.1 | 1.00 | 4.50 | (1.845) | 31.1 | 33.4 | 33.4 | .877 |
| .039 | .629 | 25.8 | 30.6 | .99 | 9.01 | | -- | -- | 32.7 | .428 |
| .039 | .642 | 26.8 | 30.2 | .99 | 13.60 | | 31.1 | 34.5 | 32.0 | .278 |
| .043 | .692 | 26.4 | 28.2 | .98 | 22.56 | | -- | -- | 27.1 | .142 |
| .040 | .650 | 26.6 | 40.1 | 1.00 | 6.36 | (1.951) | 27.3 | 27.5 | 28.2 | .555 |
| .040 | .648 | 26.3 | 40.0 | 1.00 | 12.56 | | 25.6 | 26.2 | 28.3 | .281 |
| .040 | .654 | 26.0 | 39.1 | 1.00 | 18.88 | | 26.4 | 25.5 | 28.0 | .185 |
| .040 | .643 | 25.8 | 40.0 | 1.00 | 31.38 | | -- | -- | 24.4 | .097 |
| .040 | .624 | 25.7 | 60.4 | .99 | 9.80 | (2.110) | 12.4 | 12.4 | 21.2 | .292 |
| .039 | .626 | 25.8 | 60.4 | .99 | 19.71 | | 12.3 | 12.5 | 20.8 | .143 |
| .038 | .596 | 26.0 | 63.3 | 1.00 | 29.49 | | 11.7 | 13.1 | 20.2 | .093 |
| .039 | .620 | 25.4 | 61.4 | 1.00 | 49.14 | | 12.5 | 13.1 | 19.0 | .052 |
| .043 | .682 | 35.2 | 20 | 1.07 | 2.63 | (1.588) | -- | -- | 34.7 | 1.341 |
| .042 | .660 | 36.0 | 19.1 | .94 | 5.29 | | 25.7 | 26.9 | 33.5 | .643 |
| .040 | .638 | 35.9 | 20.0 | 1.00 | 7.90 | | 26.2 | 27.3 | 32.2 | .414 |
| .041 | .663 | 36.2 | 18.6 | 1.00 | 13.26 | | -- | -- | 25.2 | .193 |
| .040 | .644 | 36.1 | 31.1 | .94 | 4.42 | (1.713) | 24.5 | 25.9 | 31.0 | .769 |
| .040 | .649 | 35.2 | 28.8 | .99 | 8.68 | | 24.3 | 24.4 | 30.8 | .389 |
| .040 | .642 | 36.3 | 30.2 | .98 | 13.09 | | 23.8 | 25.2 | 30.0 | .251 |
| .040 | .648 | 36.1 | 29.2 | 1.02 | 21.84 | | -- | -- | 26.0 | .130 |
| .040 | .638 | 36.2 | 39.0 | 1.03 | 6.12 | (1.816) | 21.6 | 23.0 | 24.7 | .469 |
| .040 | .636 | 36.0 | 39.8 | .99 | 12.28 | | 24.0 | 25.2 | 26.6 | .252 |
| .042 | .640 | 35.9 | 38.8 | 1.00 | 18.57 | | 21.5 | 22.6 | 26.5 | .166 |
| .040 | .636 | 35.8 | 39.1 | 1.02 | 30.75 | | 20.3 | 21.2 | 25.0 | .095 |
| .043 | .684 | 34.2 | 54.8 | 1.01 | 9.70 | (1.976) | 13.4 | 11.4 | 21.7 | .283 |
| .043 | .692 | 36.2 | 55.0 | .99 | 19.34 | | 14.4 | 11.9 | 21.4 | .140 |
| .043 | .686 | 35.4 | 55.7 | .98 | 29.01 | | 14.1 | 11.7 | 21.4 | .093 |
| .043 | .690 | 36.1 | 55.6 | 1.00 | 47.84 | | 12.4 | 10.6 | 19.1 | .050 |
| .042 | .663 | 50.3 | 19.2 | .99 | 4.02 | (1.467) | 14.6 | 14.8 | 30.7 | .717 |
| .042 | .676 | 51.0 | 19.4 | .98 | 8.02 | | 16.1 | 16.7 | 30.8 | .361 |
| .042 | .666 | 51.2 | 19.2 | 1.00 | 12.02 | | 16.3 | 17.2 | 25.3 | .198 |
| .041 | .664 | 51.2 | 19.8 | .94 | 20.05 | | -- | -- | 12.9 | .060 |
| .041 | .642 | 50.2 | 29.3 | .98 | 5.09 | (1.578) | 16.4 | 16.6 | 30.4 | .603 |
| .041 | .649 | 50.0 | 29.0 | 1.00 | 10.38 | | 15.0 | 15.0 | 30.3 | .295 |
| .042 | .634 | 48.7 | 28.8 | 1.00 | 15.51 | | 17.6 | 16.7 | 29.4 | .191 |
| .041 | .632 | 49.2 | 29.4 | .99 | 25.83 | | 16.8 | 16.3 | 21.1 | .083 |
| .041 | .644 | 49.6 | 38.6 | 1.00 | 6.62 | (1.673) | 14.2 | 14.0 | 25.8 | .418 |
| .042 | .677 | 51.1 | 38.4 | 1.00 | 13.27 | | 15.5 | 16.2 | 26.0 | .210 |
| .042 | .662 | 50.6 | 38.4 | 1.00 | 19.54 | | 15.2 | 15.7 | 26.3 | .144 |
| .041 | .656 | 50.4 | 38.8 | .99 | 33.13 | | 16.0 | 16.2 | 22.1 | .071 |
| .042 | .660 | 50.8 | 57.5 | 1.01 | 9.85 | (1.827) | 13.1 | 12.2 | 20.0 | .237 |
| .041 | .655 | 50.2 | 58.2 | 1.00 | 19.75 | | 12.1 | 11.6 | 19.3 | .114 |
| .041 | .648 | 51.1 | 59.4 | 1.01 | 29.66 | | 13.1 | 13.3 | 19.5 | .077 |
| .042 | .628 | 48.0 | 57.3 | 1.01 | 49.39 | | 12.5 | 11.8 | 18.1 | .043 |
| .045 | .692 | 74.4 | 18.4 | 1.00 | 3.38 | (1.348) | 11.0 | 10.8 | 28.2 | .719 |
| .045 | .722 | 77.0 | 17.8 | 1.00 | 5.78 | | 9.5 | 10.0 | 27.0 | .403 |
| .039 | .610 | 75.3 | 20.4 | 1.01 | 9.20 | | 12.8 | 12.9 | 23.6 | .222 |
| .042 | .640 | 73.6 | 19.1 | .98 | 13.76 | | 9.8 | 9.4 | 19.9 | .125 |
| .040 | .616 | 74.4 | 30.0 | 1.00 | 5.91 | (1.440) | 9.7 | 9.6 | 25.8 | .402 |
| .040 | .611 | 73.5 | 29.9 | 1.00 | 9.73 | | 9.3 | 9.0 | 26.0 | .246 |
| .040 | .607 | 73.4 | 30.2 | 1.00 | 15.65 | | 10.0 | 9.5 | 25.4 | .149 |
| .039 | .630 | 76.6 | 31.1 | .96 | 23.39 | | 9.8 | 10.3 | 20.8 | .082 |
| .040 | .610 | 73.6 | 39.9 | 1.00 | 8.43 | (1.521) | 9.0 | 8.7 | 23.6 | .272 |
| .040 | .624 | 74.5 | 39.8 | 1.00 | 13.99 | | 8.7 | 8.6 | 22.6 | .157 |
| .039 | .610 | 74.0 | 40.6 | .99 | 22.31 | | 9.4 | 9.2 | 22.3 | .097 |
| .040 | .619 | 73.2 | 39.6 | 1.00 | 33.66 | | 8.2 | 7.8 | 21.7 | .063 |
| .039 | .624 | 75.8 | 61.2 | .99 | 13.67 | (1.658) | 9.6 | 9.8 | 18.1 | .141 |
| .040 | .616 | 74.8 | 60.2 | 1.01 | 22.80 | | 8.2 | 8.2 | 18.1 | .084 |
| .039 | .624 | 75.2 | 61.0 | 1.00 | 36.46 | | 8.6 | 8.6 | 18.8 | .053 |
| .039 | .622 | 75.2 | 60.6 | 1.01 | 54.70 | | 8.0 | 8.1 | 14.9 | .029 |

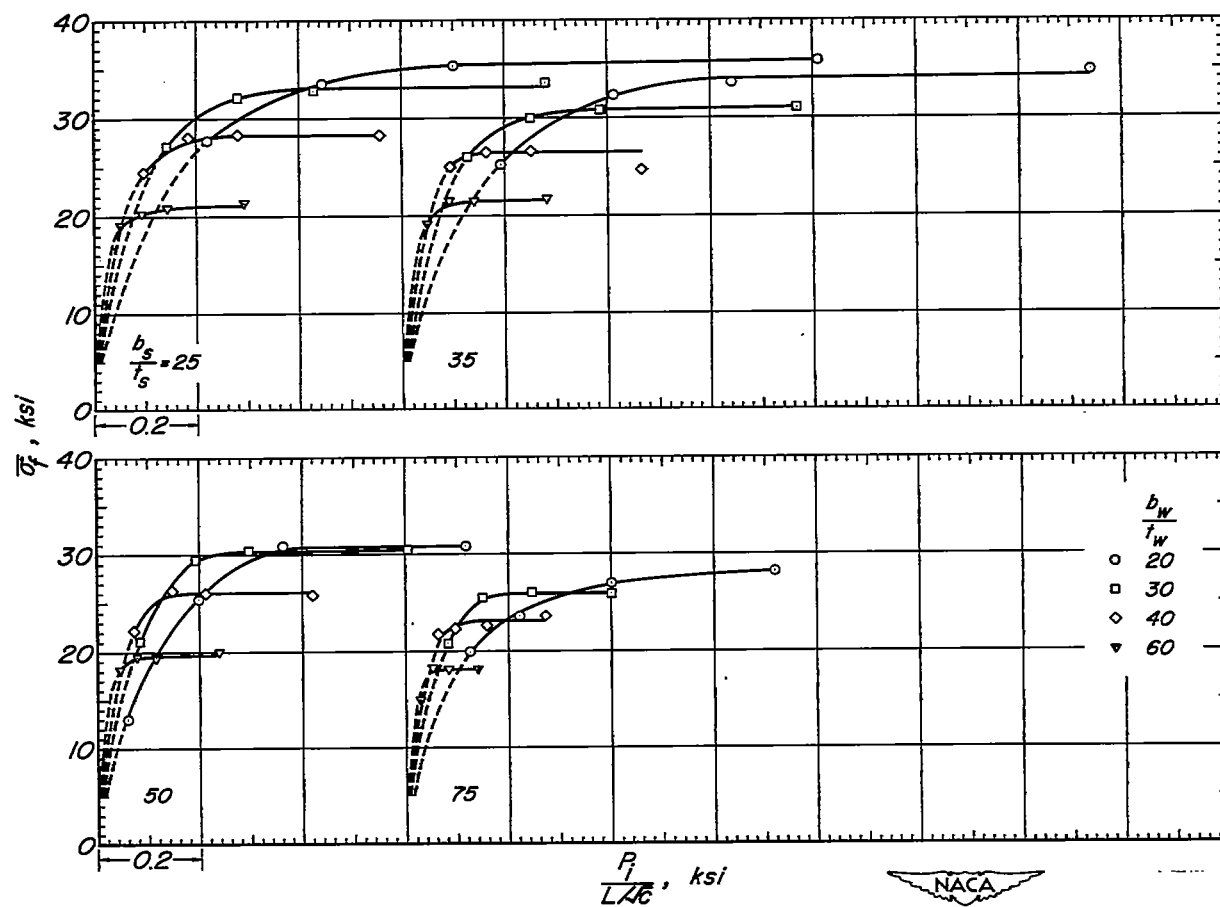


Figure 9.—Compressive strength of flat panels with hat-section stiffeners.

$$\frac{t_w}{t_s} = 0.63; \frac{b_H}{b_w} = 1.0.$$

TABLE 8

TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{t_w}{t_s} = 0.63$, $\frac{b_H}{b_w} = 1.2$

[Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-----------------|-------------------|-------------------|-------------------|-------------------------------|-----------------|---------------------------|----------|---------------------|------------------------------------|
| t_w (in.) | $\frac{b}{t_s}$ | $\frac{b_s}{t_s}$ | $\frac{b_H}{t_s}$ | $\frac{b_H}{b_w}$ | $\frac{L}{\sqrt{b}}$ (in.) | $\frac{L}{t_s}$ | $\bar{\sigma}_r$ (ksi) | | σ_f (ksi) | $\frac{P_1}{L\sqrt{b_0}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (0.63) | (25) | (20) | (1.2) | | | | | | |
| .040 | .638 | 26.2 | 20.1 | 1.19 | 2.87 | | 34.0 | 36.3 | 36.1 | 1.374 |
| .040 | .640 | 26.2 | 20.0 | 1.20 | 5.74 | (1.706) | 31.1 | 33.4 | 34.9 | .663 |
| .039 | .628 | 26.2 | 20.5 | 1.22 | 8.63 | | 32.3 | 34.6 | 34.7 | .439 |
| .040 | .638 | 25.9 | 20.4 | 1.17 | 14.29 | | -- | -- | 27.6 | .211 |
| .039 | .626 | 26.2 | 20.8 | 1.20 | 4.71 | | -- | -- | 31.6 | .786 |
| .039 | .622 | 26.2 | 20.2 | 1.20 | 9.31 | (1.830) | 29.9 | 30.2 | 32.1 | .404 |
| .040 | .636 | 26.2 | 20.2 | 1.21 | 15.92 | | -- | -- | 31.3 | .263 |
| .040 | .640 | 25.8 | 20.0 | 1.22 | 23.13 | | -- | -- | 26.3 | .132 |
| .039 | .628 | 26.2 | 21.0 | 1.20 | 6.47 | | 21.0 | 21.8 | 25.9 | .494 |
| .040 | .640 | 26.2 | 20.4 | 1.16 | 12.84 | (1.927) | 22.6 | 21.7 | 26.2 | .250 |
| .039 | .621 | 25.6 | 20.8 | 1.19 | 19.50 | | 20.4 | 20.8 | 25.6 | .184 |
| .040 | .638 | 25.7 | 20.4 | 1.20 | 32.15 | | 20.4 | 21.2 | 22.1 | .085 |
| .040 | .624 | 25.4 | 20.6 | 1.19 | 10.03 | | 10.2 | 10.2 | 19.9 | .262 |
| .039 | .620 | 25.6 | 20.2 | 1.19 | 20.10 | (2.064) | 10.0 | 10.1 | 19.7 | .129 |
| .040 | .626 | 25.4 | 20.6 | 1.20 | 30.17 | | 8.0 | 8.0 | 19.1 | .084 |
| .039 | .621 | 25.8 | 21.0 | 1.21 | 50.22 | | 6.4 | 6.8 | 15.9 | .036 |
| .043 | .682 | (35) | (20) | | | | | | | |
| .041 | .666 | 35.8 | 17.8 | 1.26 | 2.71 | | -- | -- | 34.7 | 1.302 |
| .042 | .665 | 36.4 | 19.1 | 1.18 | 5.51 | (1.590) | 26.4 | 28.2 | 34.3 | .634 |
| .040 | .644 | 36.1 | 19.1 | 1.16 | 8.18 | | 26.6 | 27.9 | 33.2 | .413 |
| .040 | .644 | 36.1 | 19.7 | 1.20 | 13.70 | | -- | -- | 28.6 | .198 |
| .039 | .637 | 36.4 | 29.6 | 1.20 | 4.47 | | 22.6 | 24.2 | 29.0 | .710 |
| .040 | .646 | 36.3 | 29.6 | 1.22 | 8.97 | (1.708) | 23.8 | 25.2 | 30.0 | .366 |
| .040 | .650 | 36.2 | 29.0 | 1.22 | 13.47 | | 24.5 | 26.0 | 29.7 | .239 |
| .040 | .664 | 37.3 | 29.2 | 1.20 | 22.56 | | 23.8 | 26.4 | 26.0 | .126 |
| .040 | .667 | 37.0 | 39.6 | 1.20 | 6.37 | | 20.8 | 20.6 | 25.0 | .453 |
| .040 | .630 | 34.9 | 39.9 | 1.16 | 12.60 | (1.803) | 19.6 | 18.5 | 24.5 | .224 |
| .040 | .644 | 36.4 | 40.0 | 1.20 | 18.93 | | 21.4 | 21.4 | 24.5 | .149 |
| .040 | .643 | 36.0 | 40.0 | 1.21 | 31.54 | | 19.5 | 19.7 | 22.5 | .062 |
| .040 | .643 | 36.0 | 52.8 | 1.20 | 9.92 | | 9.9 | 9.8 | 19.1 | .240 |
| .043 | .683 | 35.6 | 55.4 | 1.18 | 19.75 | (1.947) | 10.1 | 8.3 | 20.3 | .128 |
| .040 | .644 | 35.1 | 59.8 | 1.19 | 29.72 | | 9.7 | 9.2 | 18.8 | .079 |
| .043 | .686 | 34.8 | 55.1 | 1.20 | 49.52 | | 10.3 | 8.6 | 17.7 | .045 |
| .041 | .650 | (50) | (20) | | | | | | | |
| .043 | .685 | 50.6 | 20.0 | 1.16 | 4.11 | (1.472) | 17.5 | 17.9 | 31.5 | .721 |
| .042 | .682 | 51.0 | 18.6 | 1.19 | 8.18 | | 13.4 | 13.9 | 31.8 | .366 |
| .042 | .676 | 50.8 | 19.4 | 1.18 | 12.23 | | 17.1 | 17.7 | 26.2 | .202 |
| .042 | .662 | 50.2 | 19.8 | 1.18 | 20.35 | | -- | -- | 13.5 | .063 |
| .041 | .627 | 48.6 | 29.0 | 1.22 | 5.31 | | 16.7 | 15.8 | 28.5 | .943 |
| .041 | .630 | 48.4 | 29.1 | 1.20 | 10.54 | (1.580) | 17.4 | 16.2 | 28.9 | .277 |
| .041 | .637 | 47.8 | 28.6 | 1.22 | 15.86 | | 19.2 | 17.6 | 28.6 | .182 |
| .042 | .657 | 50.0 | 28.8 | 1.20 | 25.94 | | 15.4 | 15.4 | 21.9 | .086 |
| .042 | .653 | 49.9 | 38.5 | 1.20 | 6.73 | | 15.3 | 15.3 | 24.9 | .395 |
| .042 | .671 | 50.4 | 38.2 | 1.20 | 15.61 | (1.670) | 15.8 | 16.0 | 24.6 | .194 |
| .041 | .640 | 50.0 | 39.1 | 1.18 | 20.29 | | 15.5 | 15.5 | 24.3 | .128 |
| .042 | .668 | 50.2 | 38.0 | 1.20 | 33.81 | | -- | -- | 22.5 | .071 |
| .041 | .646 | 49.4 | 58.0 | 1.20 | 10.07 | | 9.9 | 9.4 | 19.0 | .219 |
| .041 | .670 | 52.0 | 58.4 | 1.20 | 20.21 | (1.813) | 10.2 | 9.6 | 18.8 | .108 |
| .041 | .661 | 51.6 | 58.2 | 1.21 | 30.29 | | 11.3 | 10.9 | 18.4 | .071 |
| .042 | .674 | 51.4 | 56.2 | 1.22 | 50.48 | | 10.3 | 9.3 | 17.4 | .040 |
| .039 | .600 | (75) | (20) | | | | | | | |
| .039 | .601 | 75.0 | 20.5 | 1.20 | 3.62 | (1.355) | 11.0 | 11.0 | 26.0 | .623 |
| .039 | .600 | 74.5 | 20.4 | 1.20 | 5.95 | | 10.0 | 9.9 | 25.3 | .368 |
| .039 | .600 | 73.8 | 20.5 | 1.18 | 9.63 | | 9.6 | 9.3 | 25.8 | .214 |
| .039 | .598 | 74.0 | 20.6 | 1.18 | 14.39 | | 8.5 | 8.3 | 18.7 | .113 |
| .040 | .611 | 74.4 | 29.8 | 1.23 | 6.06 | | 7.7 | 7.6 | 25.7 | .392 |
| .039 | .608 | 74.6 | 30.6 | 1.20 | 10.16 | (1.446) | 10.0 | 9.9 | 24.4 | .222 |
| .039 | .610 | 74.4 | 31.8 | 1.15 | 16.18 | | 8.5 | 8.4 | 24.0 | .137 |
| .039 | .613 | 74.2 | 30.6 | 1.20 | 24.52 | | 11.0 | 10.8 | 19.7 | .075 |
| .040 | .604 | 71.8 | 41.0 | 1.18 | 8.73 | | 8.8 | 8.1 | 21.9 | .245 |
| .040 | .608 | 72.8 | 40.1 | 1.20 | 14.51 | (1.525) | 9.1 | 8.6 | 21.9 | .148 |
| .040 | .620 | 75.0 | 40.0 | 1.20 | 23.20 | | 8.0 | 8.0 | 21.4 | .090 |
| .040 | .606 | 73.0 | 40.4 | 1.20 | 34.78 | | 10.5 | 10.0 | 18.6 | .052 |
| .040 | .635 | 76.8 | 60.2 | 1.20 | 13.97 | | 9.4 | 9.9 | 17.3 | .131 |
| .039 | .634 | 75.2 | 61.5 | 1.20 | 23.25 | (1.656) | 8.3 | 9.0 | 16.3 | .074 |
| .039 | .604 | 73.8 | 61.4 | 1.20 | 37.46 | | 8.6 | 8.3 | 17.3 | .049 |
| .039 | .612 | 74.2 | 60.4 | 1.20 | 55.73 | | 8.6 | 8.6 | 14.2 | .027 |

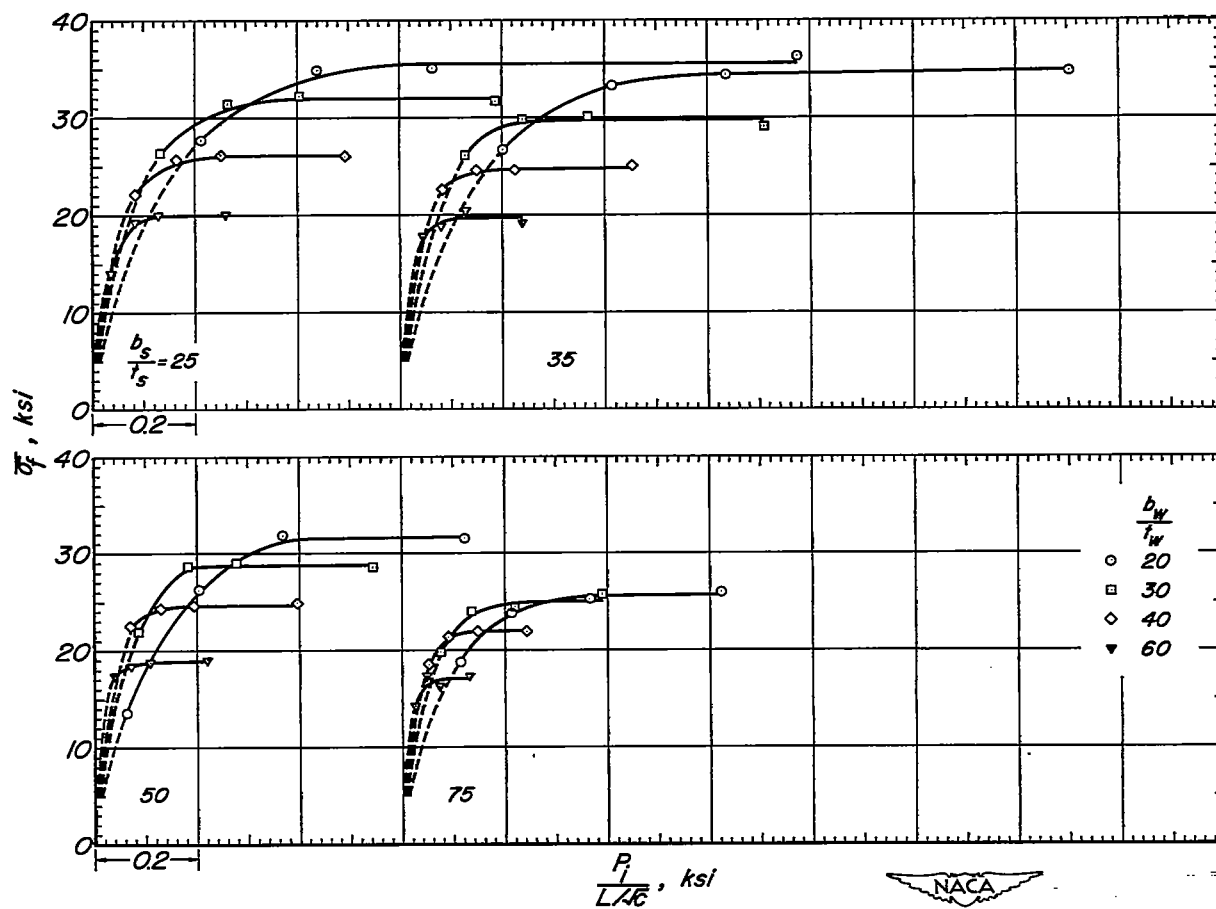


Figure 10.-Compressive strength of flat panels with hat-section stiffeners.

$$\frac{t_w}{t_s} = 0.63; \frac{b_H}{b_w} = 1.2.$$

TABLE 9
TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{t_w}{t_s} = 1.00$, $\frac{b_w}{t_s} = 0.6$
[Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|---------------------------------|--|----------------------|----------|---------------------------|-------------------------------------|
| t_w (in.) | $\frac{t_w}{t_s}$ | $\frac{b_s}{t_s}$ | $\frac{b_w}{t_w}$ | $\frac{b_H}{b_w}$ | $\frac{L}{\sqrt{b_s}}$ (in.) | $\bar{\epsilon}$ $\frac{\epsilon}{t_s}$ | σ or (ksi) | | $\bar{\sigma}_f$ (ksi) | $\frac{P_1}{L/\sqrt{b_s}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (1.00) | (25) | (20) | (0.6) | | | | | | |
| .039 | .953 | 24.2 | 20.0 | .61 | 4.23 | | 37.0 | 35.5 | 39.7 | 0.918 |
| .039 | .944 | 24.2 | 20.2 | .58 | 7.03 | (2.449) | 38.4 | 37.6 | 39.1 | .545 |
| .039 | .952 | 24.4 | 20.2 | .63 | 11.20 | | 31.7 | 30.7 | 32.9 | .288 |
| .039 | .935 | 24.0 | 20.4 | .62 | 16.78 | | -- | -- | 20.0 | .117 |
| .040 | .944 | 24.6 | 30.2 | .60 | 6.81 | | -- | -- | 36.3 | .586 |
| .039 | .956 | 24.8 | 30.6 | .59 | 11.33 | (2.751) | -- | -- | 35.9 | .549 |
| .039 | .954 | 24.6 | 30.9 | .60 | 18.20 | | -- | -- | 32.6 | .197 |
| .039 | .914 | 24.6 | 30.9 | .60 | 27.16 | | 17.7 | 17.0 | 20.3 | .082 |
| .039 | .944 | 24.6 | 40.8 | .60 | 9.37 | | 28.6 | 29.5 | 30.7 | .392 |
| .039 | .947 | 24.9 | 40.8 | .60 | 15.68 | (2.995) | 25.3 | 26.2 | 30.8 | .235 |
| .039 | .941 | 25.3 | 40.4 | .62 | 25.02 | | 27.9 | 28.4 | 30.4 | .165 |
| .039 | .936 | 24.8 | 40.7 | .60 | 37.54 | | 19.2 | 17.4 | 21.7 | .069 |
| .038 | .943 | 25.4 | 62.6 | .61 | 14.49 | | 14.8 | 16.1 | 23.6 | .219 |
| .039 | .953 | 25.6 | 61.5 | .60 | 24.05 | (3.369) | 13.4 | 14.1 | 23.9 | .134 |
| .039 | .932 | 24.6 | 62.0 | .61 | 38.50 | | 13.2 | 14.1 | 22.4 | .078 |
| .039 | .942 | 24.8 | 60.9 | .61 | 57.73 | | 11.8 | 12.2 | 17.9 | .042 |
| .039 | .982 | 32.4 | 20.8 | .56 | 4.07 | | 29.1 | 25.8 | 37.1 | .806 |
| .039 | .994 | 32.7 | 20.3 | .56 | 6.88 | (2.212) | 29.0 | 25.9 | 35.7 | .459 |
| .041 | .976 | 31.1 | 20.0 | .54 | 10.91 | | 30.6 | 28.4 | 31.6 | .256 |
| .041 | 1.033 | 32.0 | 19.3 | .59 | 16.37 | | 19.7 | 16.4 | 20.4 | .110 |
| .041 | 1.032 | 32.6 | 29.8 | .58 | 6.71 | | 28.0 | 25.1 | 33.2 | .493 |
| .040 | .974 | 31.0 | 30.0 | .60 | 11.19 | (2.491) | 30.6 | 25.1 | 32.0 | .286 |
| .040 | 1.004 | 32.2 | 30.2 | .60 | 17.88 | | 30.4 | 26.6 | 31.1 | .174 |
| .042 | 1.030 | 31.4 | 28.6 | .60 | 26.89 | | 22.0 | 17.7 | 22.9 | .085 |
| .040 | 1.007 | 32.4 | 41.2 | .58 | 9.30 | | 26.7 | 23.4 | 28.4 | .332 |
| .040 | .994 | 32.2 | 39.8 | .60 | 15.49 | (2.722) | 25.6 | 22.2 | 28.2 | .198 |
| .041 | 1.026 | 32.4 | 38.8 | .60 | 24.85 | | 26.3 | 23.1 | 28.2 | .124 |
| .041 | 1.035 | 32.3 | 38.8 | .61 | 37.23 | | 22.5 | 26.2 | 23.3 | .068 |
| .041 | 1.040 | 32.8 | 58.3 | .60 | 14.42 | | 13.8 | 13.1 | 22.1 | .190 |
| .041 | 1.028 | 33.2 | 58.7 | .59 | 23.98 | (3.091) | 14.9 | 14.2 | 22.3 | .115 |
| .041 | 1.018 | 32.6 | 59.0 | .60 | 38.40 | | 15.2 | 14.7 | 21.4 | .069 |
| .040 | 1.028 | 33.6 | 60.8 | .60 | 57.57 | | 16.0 | 16.4 | 19.9 | .043 |
| .038 | .970 | 51.2 | 20.9 | .61 | 3.96 | | 18.0 | 18.9 | 33.6 | .671 |
| .038 | .952 | 50.4 | 21.0 | .59 | 6.63 | (1.974) | 19.4 | 19.7 | 34.2 | .408 |
| .038 | .965 | 50.7 | 20.6 | .60 | 10.66 | | 21.1 | 21.8 | 29.8 | .221 |
| .039 | .949 | 49.2 | 20.6 | .58 | 15.95 | | 20.2 | 19.6 | 20.9 | .104 |
| .040 | .986 | 49.8 | 29.8 | .63 | 6.61 | | 17.2 | 17.1 | 32.0 | .430 |
| .039 | .989 | 51.2 | 30.8 | .58 | 11.00 | (2.219) | 17.8 | 18.8 | 31.2 | .252 |
| .040 | 1.018 | 50.4 | 30.0 | .60 | 17.54 | | 20.1 | 20.5 | 29.7 | .150 |
| .041 | 1.032 | 51.2 | 29.2 | .62 | 26.34 | | 19.8 | 20.7 | 21.4 | .072 |
| .039 | .971 | 50.7 | 41.0 | .58 | 9.19 | | 17.9 | 18.4 | 27.5 | .291 |
| .041 | 1.035 | 50.6 | 38.7 | .59 | 15.34 | (2.430) | 18.4 | 18.9 | 28.8 | .182 |
| .038 | .956 | 49.0 | 41.8 | .60 | 24.53 | | 19.1 | 18.4 | 26.0 | .103 |
| .042 | 1.049 | 50.2 | 38.2 | .62 | 36.71 | | 20.3 | 20.5 | 22.2 | .055 |
| .040 | 1.020 | 50.7 | 58.6 | .62 | 14.40 | | 14.9 | 14.2 | 22.6 | .175 |
| .040 | 1.007 | 50.6 | 60.0 | .61 | 23.94 | (2.780) | 14.8 | 14.8 | 22.0 | .102 |
| .041 | 1.028 | 50.6 | 60.6 | .58 | 38.18 | | 15.1 | 14.4 | 21.8 | .064 |
| .041 | 1.032 | 51.8 | 60.0 | .60 | 57.20 | | 14.4 | 13.4 | 18.6 | .036 |
| .041 | 1.029 | 76.1 | 19.4 | .62 | 3.78 | | 8.2 | 8.4 | 30.3 | .555 |
| .040 | 1.023 | 76.7 | 18.7 | .65 | 6.34 | (1.733) | 11.5 | 12.0 | 29.7 | .325 |
| .041 | 1.032 | 75.3 | 19.6 | .60 | 10.11 | | 11.4 | 11.5 | 28.1 | .193 |
| .042 | 1.048 | 76.0 | 19.6 | .58 | 15.04 | | 9.5 | 9.7 | 19.7 | .091 |
| .041 | 1.042 | 76.8 | 29.3 | .58 | 6.40 | | 10.4 | 10.9 | 30.0 | .363 |
| .043 | 1.091 | 77.2 | 28.2 | .58 | 10.63 | (1.935) | 10.3 | 10.9 | 31.0 | .225 |
| .041 | 1.045 | 76.8 | 29.2 | .60 | 16.98 | | 8.6 | 9.3 | 27.9 | .127 |
| .042 | 1.072 | 77.5 | 28.6 | .59 | 25.38 | | 14.4 | 15.4 | 19.3 | .059 |
| .041 | 1.038 | 76.4 | 38.8 | .59 | 8.88 | | 12.7 | 13.2 | 27.2 | .259 |
| .041 | 1.048 | 78.0 | 39.2 | .60 | 15.00 | (2.115) | 9.6 | 10.5 | 26.8 | .161 |
| .043 | 1.082 | 76.6 | 37.5 | .58 | 23.80 | | 11.5 | 12.0 | 27.5 | .089 |
| .041 | 1.053 | 77.9 | 38.6 | .58 | 35.86 | | 10.9 | 11.8 | 19.8 | .047 |
| .041 | 1.047 | 77.3 | 59.0 | .59 | 14.03 | | 16.5 | 17.5 | 21.6 | .149 |
| .041 | 1.050 | 76.8 | 57.7 | .60 | 23.54 | (2.423) | 11.8 | 12.4 | 21.6 | .089 |
| .042 | 1.052 | 76.6 | 57.4 | .59 | 37.88 | | 9.7 | 10.2 | 21.3 | .055 |
| .042 | 1.064 | 77.7 | 57.6 | .60 | 56.55 | | 13.6 | 14.6 | 17.6 | .030 |

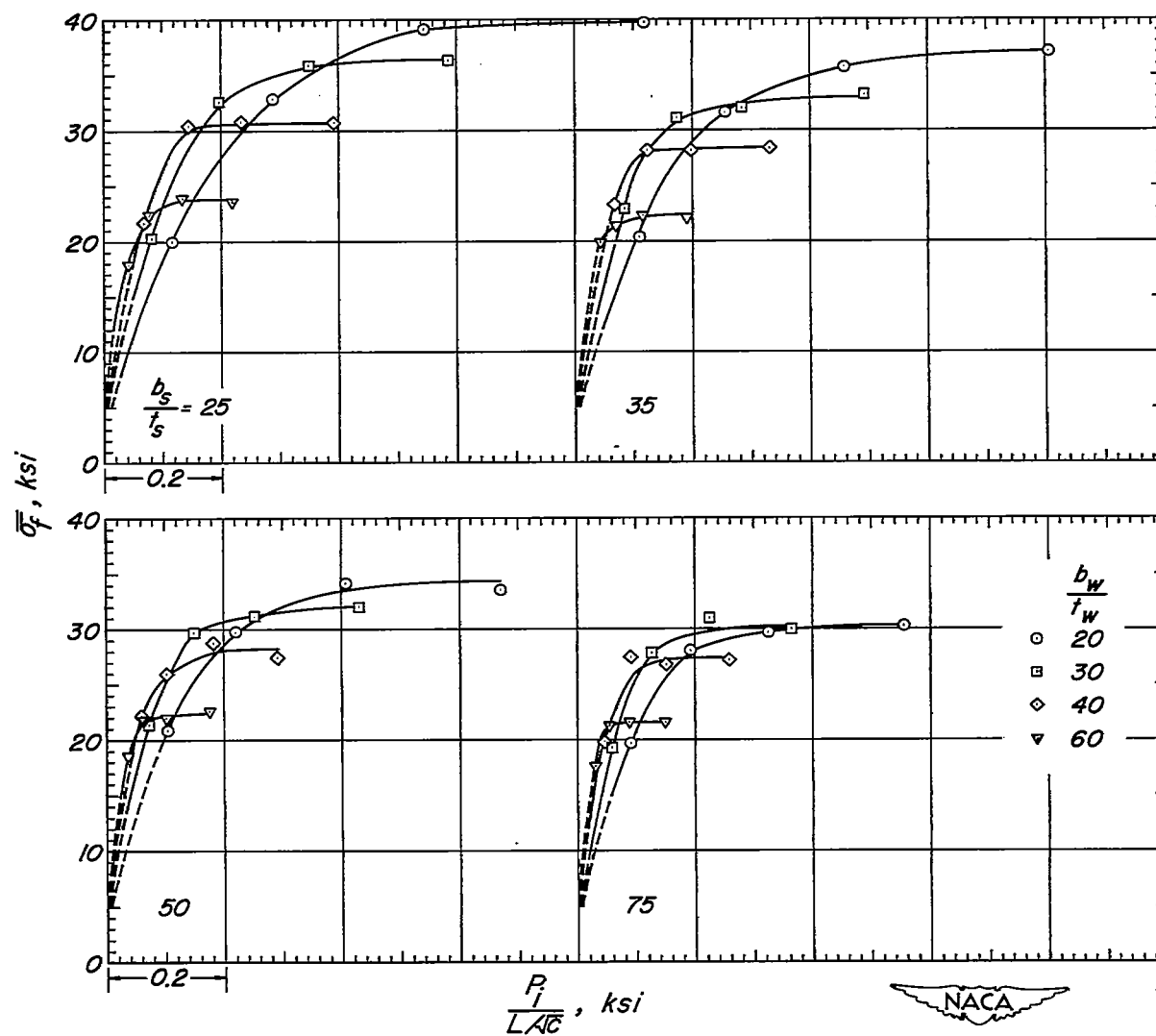


Figure 11.- Compressive strength of flat panels with hat-section stiffeners.

$$\frac{t_w}{t_s} = 1.00; \quad \frac{b_H}{b_w} = 0.6.$$

TABLE 10
 TEST DATA FOR FLAT PANELS WITH HAT SECTION STIFFENERS WITH $\frac{t_w}{t_s} = 1.00$, $\frac{b_H}{b_W} = 0.8$
 [Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|---------------------------------|------------------------------|---------------------|----------|---------------------|-------------------------------------|
| t_w (in.) | $\frac{t_w}{t_s}$ | $\frac{b_s}{t_s}$ | $\frac{b_W}{t_W}$ | $\frac{b_H}{b_W}$ | $\frac{L}{\sqrt{b_s}}$ (in.) | τ $\frac{\tau}{t_s}$ | σ_r (ksi) | | σ_f (ksi) | $\frac{P_1}{L/\sqrt{b_s}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (1.00) | (25) | (20) | (0.8) | | | | | | |
| .039 | .922 | 25.4 | 20.8 | .77 | 4.42 | (2.416) | 35.8 | 36.5 | 38.6 | 0.845 |
| .039 | .922 | 24.7 | 20.3 | .78 | 7.27 | | 36.9 | 36.3 | 37.9 | .495 |
| .039 | .929 | 25.2 | 21.2 | .75 | 11.75 | | 31.0 | 32.0 | 32.6 | .268 |
| .039 | .929 | 24.7 | 21.0 | .80 | 17.73 | | -- | -- | 20.4 | .111 |
| .039 | .942 | 24.6 | 22.0 | .76 | 7.05 | (2.680) | -- | -- | 35.4 | .538 |
| .039 | .932 | 24.5 | 20.6 | .79 | 11.78 | | 33.4 | 30.7 | 35.2 | .522 |
| .039 | .943 | 24.8 | 20.0 | .81 | 18.74 | | -- | -- | 34.6 | .198 |
| .039 | .926 | 24.6 | 30.6 | .82 | 28.29 | | 19.6 | 16.1 | 21.5 | .082 |
| .039 | .921 | 24.1 | (40) | .78 | 9.71 | (2.885) | 27.3 | 29.0 | 29.2 | .347 |
| .038 | .934 | 25.0 | 31.2 | .81 | 16.21 | | 26.1 | 27.4 | 28.9 | .206 |
| .039 | .942 | 25.2 | 40.8 | .80 | 25.96 | | 27.4 | 25.8 | 29.0 | .128 |
| .039 | .942 | 24.9 | 40.4 | .80 | 38.34 | | 20.6 | 18.8 | 21.7 | .064 |
| .038 | .938 | 25.0 | (60) | .82 | 14.86 | (3.180) | 13.3 | 14.0 | 22.0 | .188 |
| .039 | .951 | 25.2 | 62.1 | .80 | 24.87 | | 13.5 | 14.6 | 21.7 | .111 |
| .038 | .925 | 24.0 | 62.2 | .80 | 39.85 | | 12.4 | 13.4 | 20.2 | .064 |
| .039 | .932 | 25.0 | 60.2 | .82 | 59.70 | | 11.8 | 12.6 | 15.1 | .052 |
| .040 | 1.010 | (35) | (20) | .78 | 4.32 | (2.199) | 32.1 | 29.5 | 36.9 | .751 |
| .040 | .990 | 33.2 | 20.2 | .77 | 7.18 | | 28.8 | 25.7 | 34.8 | .427 |
| .039 | .974 | 31.4 | 20.6 | .85 | 11.54 | | 30.6 | 25.7 | 31.3 | .239 |
| .040 | 1.012 | 32.9 | 20.2 | .80 | 17.33 | | 20.6 | 18.3 | 21.7 | .110 |
| .040 | 1.000 | 31.8 | 30.3 | .78 | 6.99 | (2.450) | 28.5 | 24.4 | 32.1 | .450 |
| .040 | 1.013 | 33.0 | 30.3 | .80 | 11.70 | | 26.1 | 23.7 | 30.3 | .284 |
| .040 | 1.027 | 31.2 | 29.8 | .80 | 18.67 | | 26.6 | 30.6 | 28.9 | .152 |
| .041 | 1.024 | 32.2 | 29.5 | .80 | 27.98 | | 21.7 | 18.5 | 22.9 | .080 |
| .041 | 1.023 | 31.7 | (40) | .80 | 9.62 | (2.652) | 19.9 | 21.3 | 26.6 | .293 |
| .040 | 1.010 | 33.4 | 39.6 | .80 | 16.09 | | 24.9 | 27.7 | 27.3 | .180 |
| .040 | 1.024 | 33.2 | 40.8 | .79 | 25.73 | | 21.7 | 26.8 | 26.4 | .109 |
| .041 | 1.036 | 32.4 | 38.4 | .83 | 38.64 | | 21.5 | 24.4 | 22.4 | .061 |
| .040 | 1.029 | 33.2 | (60) | .81 | 14.86 | (2.956) | 11.2 | 13.0 | 20.0 | .159 |
| .041 | 1.020 | 32.4 | 58.6 | .80 | 21.97 | | 13.1 | 12.5 | 21.0 | .113 |
| .041 | 1.024 | 32.0 | 58.2 | .78 | 39.69 | | 12.8 | 12.1 | 20.1 | .060 |
| .041 | 1.033 | 31.2 | 58.6 | .80 | 59.49 | | 13.7 | 13.1 | 18.0 | .036 |
| .038 | .956 | (50) | (20) | .76 | 4.24 | (1.975) | 21.2 | 22.0 | 33.8 | .630 |
| .041 | 1.030 | 50.8 | 21.1 | .78 | 6.99 | | 19.2 | 19.6 | 32.4 | .377 |
| .038 | .958 | 50.6 | 19.6 | .79 | 11.22 | | 19.9 | 20.6 | 28.6 | .201 |
| .041 | 1.031 | 51.0 | 20.2 | .76 | 16.85 | | 19.9 | 20.7 | 21.3 | .100 |
| .040 | .988 | 49.9 | 31.2 | .77 | 6.88 | (2.204) | 19.1 | 19.0 | 30.7 | .394 |
| .038 | .980 | 50.8 | 31.4 | .81 | 11.46 | | 17.2 | 17.2 | 30.3 | .255 |
| .039 | .954 | 48.0 | 30.8 | .80 | 18.34 | | 19.1 | 17.6 | 30.0 | .144 |
| .039 | .984 | 50.2 | 30.3 | .81 | 27.54 | | 20.0 | 20.2 | 21.2 | .068 |
| .041 | 1.033 | 50.6 | (40) | .80 | 9.58 | (2.395) | 17.7 | 18.1 | 27.7 | .277 |
| .042 | 1.018 | 48.8 | 38.2 | .80 | 15.92 | | 20.0 | 19.0 | 28.0 | .168 |
| .041 | 1.041 | 50.0 | 38.9 | .78 | 25.46 | | 18.6 | 18.7 | 26.7 | .101 |
| .041 | 1.018 | 49.4 | 39.2 | .80 | 38.13 | | 20.4 | 19.9 | 21.4 | .054 |
| .040 | 1.088 | 53.7 | (60) | .80 | 14.84 | (2.695) | 14.1 | 13.1 | 20.9 | .152 |
| .040 | 1.036 | 52.1 | 58.8 | .82 | 24.68 | | 13.6 | 13.0 | 20.7 | .090 |
| .041 | 1.026 | 51.3 | 59.8 | .78 | 39.52 | | 14.5 | 14.4 | 20.4 | .056 |
| .041 | .984 | 48.8 | 57.8 | .79 | 59.19 | | 14.3 | 13.3 | 16.9 | .031 |
| .041 | 1.044 | (75) | (20) | .81 | 4.04 | (1.743) | 11.0 | 11.3 | 31.1 | .537 |
| .041 | 1.047 | 75.9 | 19.6 | .80 | 6.71 | | 12.0 | 12.7 | 30.2 | .314 |
| .041 | 1.048 | 77.2 | 19.6 | .80 | 10.74 | | 11.9 | 12.4 | 27.6 | .179 |
| .041 | 1.060 | 76.7 | 19.9 | .82 | 16.11 | | 10.1 | 10.6 | 20.0 | .087 |
| .041 | 1.030 | 75.6 | (30) | .78 | 6.71 | (1.882) | 11.2 | 11.4 | 28.8 | .324 |
| .044 | 1.104 | 77.0 | 27.6 | .78 | 11.12 | | 11.8 | 12.1 | 30.0 | .103 |
| .041 | 1.045 | 77.4 | 29.2 | .79 | 17.77 | | 9.6 | 10.2 | 26.6 | .113 |
| .043 | 1.092 | 77.2 | 28.5 | .77 | 26.66 | | 9.6 | 10.2 | 20.6 | .058 |
| .041 | 1.032 | 77.1 | (40) | .78 | 9.38 | (2.107) | 11.9 | 12.6 | 25.6 | .230 |
| .041 | .996 | 74.1 | 39.1 | .79 | 15.50 | | 11.5 | 11.3 | 25.2 | .157 |
| .041 | 1.062 | 77.3 | 59.0 | .78 | 24.91 | | 8.5 | 9.0 | 25.5 | .086 |
| .041 | 1.052 | 77.8 | 58.9 | .78 | 37.35 | | 11.8 | 12.7 | 20.4 | .046 |
| .042 | 1.052 | 76.4 | (60) | .80 | 14.52 | (2.386) | 9.8 | 10.1 | 20.6 | .135 |
| .042 | 1.058 | 76.4 | 57.2 | .80 | 24.39 | | 13.0 | 13.5 | 20.6 | .080 |
| .041 | 1.038 | 76.6 | 59.2 | .80 | 39.06 | | 11.8 | 12.3 | 19.1 | .047 |
| .042 | 1.052 | 76.2 | 57.8 | .79 | 58.48 | | 13.6 | 14.0 | 15.8 | .026 |

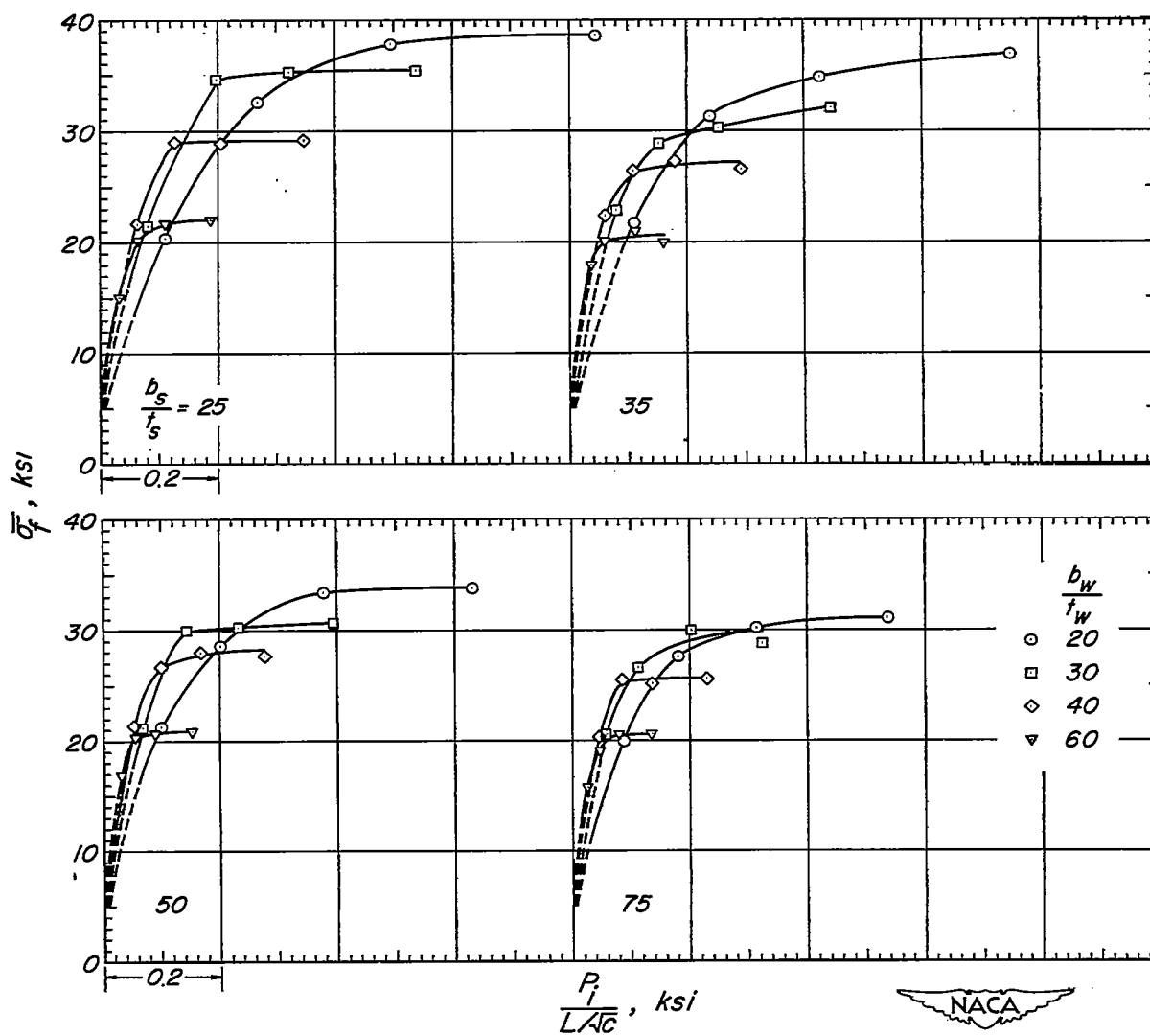


Figure 12.—Compressive strength of flat panels with hat-section stiffeners.

$$\frac{t_w}{t_s} = 1.00; \quad \frac{b_H}{b_w} = 0.8.$$

TABLE 11
 TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{t_w}{t_s} = 1.00$, $\frac{b_H}{b_W} = 1.0$
 [Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|--------------------------|-----------------------|----------------------|----------|---------------------------|-----------------------------------|
| t_w (in.) | $\frac{t_w}{t_s}$ | $\frac{b_s}{t_s}$ | $\frac{b_W}{t_w}$ | $\frac{b_H}{b_W}$ | $\frac{L}{V_c}$ (in.) | $\frac{\bar{t}}{t_s}$ | σ or (ksi) | | $\bar{\sigma}_r$ (ksi) | $\frac{P_1}{L/\sqrt{b}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (1.00) | (25) | (20) | (1.0) | | | | | | |
| .039 | .942 | 24.2 | 20.3 | .98 | 4.61 | (2.388) | 37.4 | 35.9 | 36.0 | 0.787 |
| .039 | .934 | 24.4 | 20.8 | .96 | 7.63 | | 35.8 | 34.8 | 37.7 | .472 |
| .039 | .941 | 24.4 | 20.4 | 1.00 | 12.28 | | --- | --- | 33.0 | .257 |
| .039 | .960 | 25.3 | 20.8 | .98 | 18.40 | | --- | --- | 21.2 | .110 |
| .040 | .950 | 25.0 | 30.0 | 1.00 | 7.31 | (2.620) | 30.2 | 27.7 | 33.4 | .478 |
| .039 | .928 | 24.3 | 30.8 | 1.00 | 12.16 | | 30.8 | 27.9 | 32.8 | .283 |
| .040 | .956 | 24.4 | 30.1 | 1.00 | 19.44 | | --- | --- | 31.5 | .170 |
| .038 | .922 | 24.4 | 31.0 | 1.00 | 29.25 | | 20.6 | 18.9 | 22.1 | .079 |
| .039 | .938 | 24.8 | 40.0 | 1.01 | 10.01 | (2.795) | 24.8 | 22.3 | 27.4 | .306 |
| .039 | .943 | 25.2 | 41.0 | 1.00 | 16.68 | | 21.0 | 16.7 | 27.5 | .184 |
| .039 | 1.026 | 27.6 | 40.8 | 1.00 | 26.71 | | 22.0 | 26.2 | 26.2 | .110 |
| .039 | .948 | 24.8 | 40.2 | 1.00 | 39.97 | | 21.0 | 19.3 | 22.5 | .063 |
| .039 | .944 | 25.2 | 61.2 | 1.00 | 15.31 | (3.038) | 11.8 | 12.4 | 20.7 | .164 |
| .039 | .938 | 24.0 | 61.1 | 1.00 | 25.49 | | 12.1 | 12.6 | 21.0 | .100 |
| .039 | .944 | 25.2 | 61.8 | 1.00 | 40.77 | | 11.4 | 12.1 | 19.0 | .057 |
| .039 | .942 | 24.4 | 60.2 | 1.02 | 61.14 | | 11.0 | 11.7 | 14.4 | .028 |
| .039 | .976 | 32.0 | 21.3 | .96 | 4.52 | (2.188) | 30.4 | 26.4 | 34.5 | .669 |
| .041 | 1.023 | 32.5 | 19.8 | .98 | 7.31 | | 30.0 | 26.2 | 34.5 | .402 |
| .040 | .986 | 31.0 | 21.6 | .92 | 12.07 | | --- | --- | 30.9 | .224 |
| .041 | 1.030 | 32.2 | 19.5 | .98 | 18.09 | | 20.0 | 17.0 | 21.3 | .103 |
| .040 | 1.024 | 32.7 | 30.4 | .98 | 7.24 | (2.416) | 26.4 | 23.6 | 30.2 | .404 |
| .040 | .998 | 32.7 | 31.2 | .96 | 12.07 | | 28.1 | 25.2 | 29.3 | .235 |
| .040 | 1.042 | 33.8 | 30.3 | .98 | 19.33 | | 27.6 | 26.0 | 29.0 | .145 |
| .041 | 1.038 | 31.8 | 29.1 | 1.02 | 28.95 | | 21.6 | 25.2 | 22.5 | .075 |
| .041 | 1.020 | 32.3 | 38.8 | 1.00 | 9.95 | (2.595) | 19.3 | 21.5 | 25.5 | .263 |
| .039 | .994 | 33.0 | 40.4 | 1.00 | 16.61 | | 19.3 | 21.7 | 25.1 | .157 |
| .041 | 1.020 | 33.0 | 39.2 | 1.00 | 26.50 | | 18.4 | 20.3 | 25.0 | .098 |
| .041 | 1.022 | 31.0 | 38.5 | 1.03 | 39.74 | | 20.1 | 23.1 | 21.1 | .055 |
| .039 | .949 | 31.8 | 62.0 | .98 | 15.25 | (2.851) | 10.6 | 10.4 | 19.0 | .142 |
| .041 | 1.032 | 32.0 | 57.9 | 1.00 | 25.46 | | 10.7 | 11.6 | 19.8 | .089 |
| .040 | 1.021 | 32.4 | 59.2 | 1.00 | 40.72 | | 10.0 | 10.9 | 18.2 | .051 |
| .041 | 1.038 | 31.8 | 58.9 | 1.00 | 61.00 | | 11.7 | 11.2 | 15.6 | .029 |
| .039 | .966 | 51.0 | 21.0 | .97 | 4.43 | (1.976) | 18.2 | 19.0 | 32.5 | .580 |
| .039 | .975 | 50.0 | 21.8 | .94 | 7.31 | | 21.4 | 21.5 | 33.8 | .361 |
| .039 | .968 | 50.5 | 21.1 | .96 | 11.71 | | 19.1 | 19.5 | 29.7 | .200 |
| .040 | 1.014 | 50.6 | 20.2 | .96 | 17.64 | | 20.5 | 21.1 | 22.1 | .099 |
| .041 | 1.032 | 50.6 | 29.0 | 1.00 | 7.15 | (2.191) | 17.0 | 17.4 | 30.8 | .377 |
| .039 | .978 | 50.0 | 30.8 | 1.00 | 11.87 | | 19.7 | 19.7 | 29.8 | .220 |
| .038 | .966 | 50.6 | 31.2 | .98 | 18.97 | | 18.2 | 18.7 | 27.7 | .128 |
| .039 | .938 | 48.4 | 30.7 | .96 | 28.45 | | 20.1 | 18.8 | 22.4 | .069 |
| .041 | 1.032 | 51.3 | 39.4 | 1.00 | 9.87 | (2.364) | 16.7 | 17.6 | 25.5 | .244 |
| .041 | 1.044 | 50.3 | 38.8 | 1.02 | 16.37 | | 18.0 | 18.3 | 25.4 | .146 |
| .041 | 1.019 | 49.4 | 39.0 | 1.00 | 26.18 | | 18.2 | 17.8 | 25.3 | .091 |
| .040 | 1.000 | 50.8 | 39.4 | 1.02 | 39.37 | | 19.2 | 19.8 | 20.3 | .049 |
| .040 | 1.004 | 51.4 | 61.1 | .98 | 15.20 | (2.628) | 12.7 | 12.9 | 19.7 | .136 |
| .041 | 1.038 | 49.8 | 58.2 | 1.02 | 25.34 | | 13.1 | 12.7 | 20.0 | .083 |
| .041 | 1.044 | 50.4 | 57.9 | 1.00 | 40.50 | | 13.1 | 12.2 | 19.2 | .050 |
| .041 | 1.036 | 50.6 | 58.5 | .99 | 60.72 | | 12.6 | 11.8 | 15.2 | .026 |
| .042 | 1.061 | 77.6 | 19.7 | .94 | 4.23 | (1.753) | 11.0 | 11.8 | 31.1 | .515 |
| .041 | 1.054 | 77.5 | 19.6 | .97 | 7.05 | | 10.5 | 11.2 | 29.3 | .291 |
| .042 | 1.077 | 76.8 | 19.1 | .97 | 11.23 | | 11.3 | 11.9 | 27.9 | .174 |
| .041 | 1.056 | 77.4 | 19.5 | .98 | 16.56 | | 11.1 | 11.8 | 20.4 | .086 |
| .043 | 1.106 | 77.8 | 28.2 | .98 | 7.00 | (1.938) | 10.2 | 10.9 | 28.8 | .319 |
| .041 | 1.046 | 76.8 | 28.8 | 1.00 | 11.54 | | 10.2 | 10.7 | 26.9 | .181 |
| .043 | 1.092 | 77.8 | 28.0 | 1.00 | 18.46 | | 11.7 | 12.6 | 26.9 | .113 |
| .041 | 1.086 | 76.4 | 28.4 | .98 | 27.65 | | 11.6 | 12.1 | 21.0 | .059 |
| .039 | 1.004 | 76.8 | 40.7 | 1.00 | 9.65 | (2.100) | 10.3 | 10.8 | 23.3 | .203 |
| .042 | 1.062 | 77.6 | 37.6 | 1.00 | 16.00 | | 8.8 | 9.4 | 23.9 | .126 |
| .041 | 1.055 | 77.3 | 39.2 | .99 | 25.71 | | 10.1 | 10.8 | 24.2 | .079 |
| .042 | 1.046 | 76.0 | 38.0 | 1.01 | 38.52 | | 10.8 | 11.2 | 19.5 | .042 |
| .041 | 1.060 | 78.4 | 58.0 | 1.00 | 15.05 | (2.355) | 9.2 | 10.1 | 19.6 | .123 |
| .042 | 1.064 | 76.4 | 60.7 | 1.00 | 25.08 | | 10.6 | 10.8 | 19.4 | .073 |
| .042 | 1.066 | 76.8 | 56.3 | 1.00 | 40.18 | | 9.9 | 10.4 | 17.8 | .042 |
| .041 | 1.054 | 76.8 | 56.9 | 1.01 | 60.11 | | 14.2 | 14.8 | 14.3 | .022 |

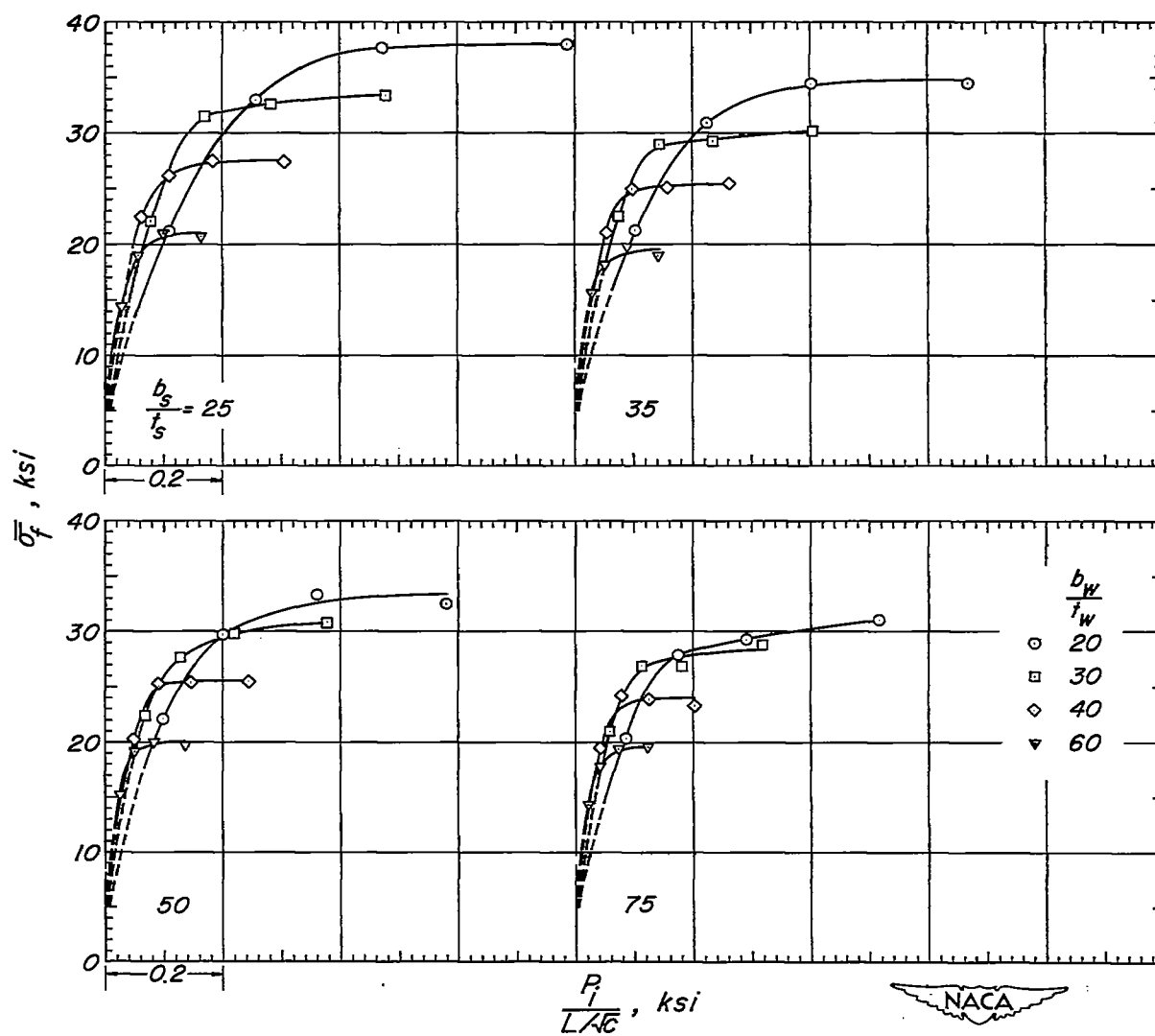


Figure 13.- Compressive strength of flat panels with hat-section stiffeners.

$$\frac{t_w}{t_s} = 1.00; \frac{b_H}{b_w} = 1.0.$$

TABLE 12
 TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{b_W}{t_s} = 1.00$, $\frac{b_H}{t_s} = 1.2$
 [Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------------------|-----------------|----------------------|----------|---------------------------|--|
| $\frac{b_W}{t_s}$ (in.) | $\frac{b_H}{t_s}$ | $\frac{b_S}{t_s}$ | $\frac{b_W}{t_s}$ | $\frac{b_H}{t_s}$ | $\frac{L}{\sqrt{c}}$ (in.) | $\frac{t}{t_s}$ | σ or (ksi) | | $\bar{\sigma}_r$ (ksi) | P_t $\frac{L}{\sqrt{c}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (1.00) | (25) | (20) | (1.2) | | | | | | |
| .038 | .914 | 24.2 | 21.2 | 1.16 | 4.76 | | 35.0 | 33.6 | 36.7 | 0.729 |
| .039 | .931 | 24.4 | 21.6 | 1.12 | 7.89 | (2.364) | 34.6 | 33.0 | 35.7 | .428 |
| .039 | .928 | 24.2 | 21.6 | 1.12 | 12.68 | | 31.7 | 30.1 | 32.6 | .243 |
| .038 | .948 | 24.8 | 20.6 | 1.23 | 18.92 | | 18.6 | 18.6 | 20.2 | .101 |
| .039 | .930 | 25.0 | (30) | 1.15 | 7.49 | | 27.0 | 25.1 | 31.6 | .434 |
| .039 | .943 | 25.7 | 30.8 | 1.19 | 12.50 | (2.572) | 24.9 | 25.1 | 31.1 | .256 |
| .039 | .946 | 25.4 | 30.4 | 1.22 | 19.95 | | --- | --- | 29.3 | .151 |
| .039 | .938 | 24.6 | 30.4 | 1.22 | 29.66 | | --- | --- | 22.5 | .077 |
| .038 | .934 | 25.0 | (40) | 1.24 | 10.21 | | 18.0 | 16.5 | 25.1 | .268 |
| .039 | .944 | 25.5 | 41.2 | 1.20 | 17.06 | (2.722) | 19.0 | 17.7 | 25.7 | .164 |
| .039 | .940 | 25.5 | 40.8 | 1.20 | 27.25 | | 17.0 | 15.6 | 25.1 | .092 |
| .039 | .947 | 25.4 | 41.0 | 1.18 | 40.91 | | 18.0 | 18.3 | 19.1 | .051 |
| .039 | .931 | 24.8 | (60) | 1.20 | 15.57 | | 10.3 | 10.7 | 19.7 | .148 |
| .039 | .935 | 25.2 | 61.2 | 1.20 | 27.97 | (2.926) | 8.2 | 7.6 | 19.4 | .088 |
| .039 | .942 | 26.0 | 61.2 | 1.20 | 41.60 | | 8.3 | 8.9 | 18.2 | .051 |
| .039 | .946 | 24.4 | 60.7 | 1.22 | 62.39 | | 8.7 | 9.3 | 13.3 | .025 |
| .040 | 1.015 | (35) | (20) | 1.18 | 4.68 | | 28.9 | 24.4 | 33.4 | .622 |
| .039 | .997 | 31.6 | 20.6 | 1.18 | 7.75 | (2.178) | 28.5 | 24.9 | 32.6 | .367 |
| .040 | .994 | 31.8 | 21.3 | 1.12 | 12.43 | | 28.7 | 24.7 | 29.4 | .206 |
| .040 | 1.000 | 31.4 | 20.1 | 1.19 | 18.62 | | 22.5 | 18.4 | 23.3 | .109 |
| .039 | .992 | 32.6 | (30) | 1.18 | 7.43 | | 20.6 | 23.4 | 28.9 | .371 |
| .040 | 1.000 | 33.1 | 32.2 | 1.08 | 12.41 | (2.387) | 21.5 | 23.8 | 28.3 | .218 |
| .040 | 1.001 | 33.2 | 30.0 | 1.20 | 19.81 | | 20.2 | 23.0 | 27.4 | .132 |
| .041 | 1.028 | 32.7 | 29.4 | 1.20 | 29.73 | | 21.4 | 24.2 | 22.4 | .072 |
| .040 | .994 | 31.0 | (40) | 1.18 | 10.17 | | 14.5 | 14.0 | 24.1 | .241 |
| .039 | .984 | 32.6 | 41.2 | 1.19 | 16.92 | (2.545) | 15.5 | 17.1 | 23.1 | .139 |
| .041 | 1.025 | 32.6 | 40.8 | 1.19 | 27.15 | | 16.5 | 18.2 | 23.2 | .087 |
| .041 | 1.018 | 32.4 | 39.2 | 1.20 | 40.72 | | 19.1 | 18.5 | 19.6 | .049 |
| .040 | 1.004 | 33.1 | (60) | 1.19 | 15.58 | | 6.0 | 6.4 | 18.2 | .129 |
| .041 | 1.040 | 33.0 | 58.5 | 1.19 | 25.98 | (2.767) | 8.9 | 9.7 | 18.6 | .079 |
| .041 | 1.025 | 32.2 | 59.0 | 1.20 | 41.56 | | 9.4 | 9.2 | 17.7 | .047 |
| .041 | 1.024 | 31.0 | 58.6 | 1.20 | 62.24 | | 8.2 | 9.0 | 14.3 | .025 |
| .038 | .976 | (50) | (20) | 1.18 | 4.58 | | 18.0 | 19.2 | 31.9 | .551 |
| .038 | .973 | 51.6 | 23.0 | 1.12 | 7.60 | (1.977) | 19.8 | 21.0 | 32.0 | .354 |
| .038 | .954 | 50.4 | 22.2 | 1.17 | 12.18 | | 16.7 | 17.0 | 30.1 | .196 |
| .039 | .978 | 49.9 | 20.3 | 1.19 | 18.28 | | 19.5 | 19.5 | 22.5 | .097 |
| .041 | 1.014 | (30) | 30.8 | 1.22 | 7.35 | | 17.9 | 17.5 | 29.9 | .354 |
| .041 | 1.020 | 50.2 | 30.6 | 1.14 | 12.08 | (2.180) | 18.6 | 18.8 | 29.2 | .213 |
| .038 | .954 | 49.5 | 31.0 | 1.20 | 19.56 | | 18.1 | 17.7 | 27.2 | .121 |
| .039 | .950 | 48.2 | 31.0 | 1.20 | 29.28 | | 20.7 | 19.2 | 21.2 | .063 |
| .040 | .980 | 49.0 | (40) | 1.20 | 10.13 | | 20.2 | 19.4 | 24.0 | .222 |
| .040 | .942 | 47.4 | 40.5 | 1.22 | 16.82 | (2.338) | 17.4 | 15.7 | 23.7 | .132 |
| .039 | .978 | 49.6 | 40.8 | 1.20 | 26.85 | | 17.0 | 16.8 | 23.0 | .080 |
| .041 | .966 | 47.3 | 39.0 | 1.22 | 40.21 | | 18.4 | 16.5 | 19.2 | .045 |
| .041 | .986 | 48.3 | (60) | 1.20 | 15.53 | | 11.5 | 11.1 | 19.1 | .127 |
| .040 | 1.022 | 50.2 | 58.9 | 1.20 | 25.83 | (2.572) | 9.8 | 9.8 | 19.0 | .076 |
| .041 | 1.036 | 50.3 | 60.7 | 1.18 | 41.38 | | 9.2 | 8.6 | 17.2 | .043 |
| .041 | 1.036 | 51.4 | 60.1 | 1.16 | 62.00 | | 9.8 | 9.2 | 14.0 | .023 |
| .041 | 1.052 | (75) | (20) | 1.15 | 4.10 | | 9.6 | 10.4 | 30.5 | .524 |
| .042 | 1.058 | 77.8 | 19.6 | 1.20 | 7.27 | (1.762) | 13.1 | 13.8 | 29.2 | .283 |
| .041 | 1.058 | 77.2 | 19.5 | 1.21 | 11.77 | | 8.3 | 9.2 | 28.3 | .169 |
| .041 | 1.052 | 77.2 | 19.4 | 1.18 | 17.51 | | 8.7 | 9.2 | 20.5 | .083 |
| .042 | 1.066 | 76.9 | (30) | 1.20 | 7.17 | | 8.7 | 9.2 | 28.1 | .304 |
| .041 | 1.047 | 76.7 | 29.7 | 1.18 | 11.88 | (1.941) | 10.5 | 11.0 | 27.7 | .181 |
| .042 | 1.062 | 76.3 | 28.6 | 1.20 | 19.00 | | 11.4 | 11.8 | 25.2 | .103 |
| .041 | 1.052 | 77.4 | 29.0 | 1.20 | 28.57 | | 11.2 | 11.9 | 19.0 | .052 |
| .042 | 1.068 | 77.5 | (40) | 1.18 | 9.87 | | 11.0 | 11.8 | 23.2 | .196 |
| .042 | 1.060 | 77.4 | 38.6 | 1.18 | 16.41 | (2.094) | 8.4 | 9.0 | 22.9 | .117 |
| .041 | 1.040 | 76.3 | 38.6 | 1.19 | 26.43 | | 8.5 | 8.8 | 22.4 | .071 |
| .041 | 1.049 | 77.8 | 38.8 | 1.18 | 39.58 | | 10.3 | 11.1 | 17.4 | .037 |
| .042 | 1.049 | 77.4 | (60) | 1.18 | 15.41 | | 8.4 | 9.0 | 18.6 | .112 |
| .040 | 1.015 | 77.0 | 60.2 | 1.20 | 25.55 | (2.329) | 8.5 | 9.0 | 17.8 | .065 |
| .041 | 1.040 | 75.2 | 56.8 | 1.22 | 40.97 | | 9.0 | 9.1 | 17.4 | .040 |
| .042 | 1.056 | 76.2 | 57.7 | 1.20 | 61.63 | | 7.1 | 6.8 | 12.3 | .019 |

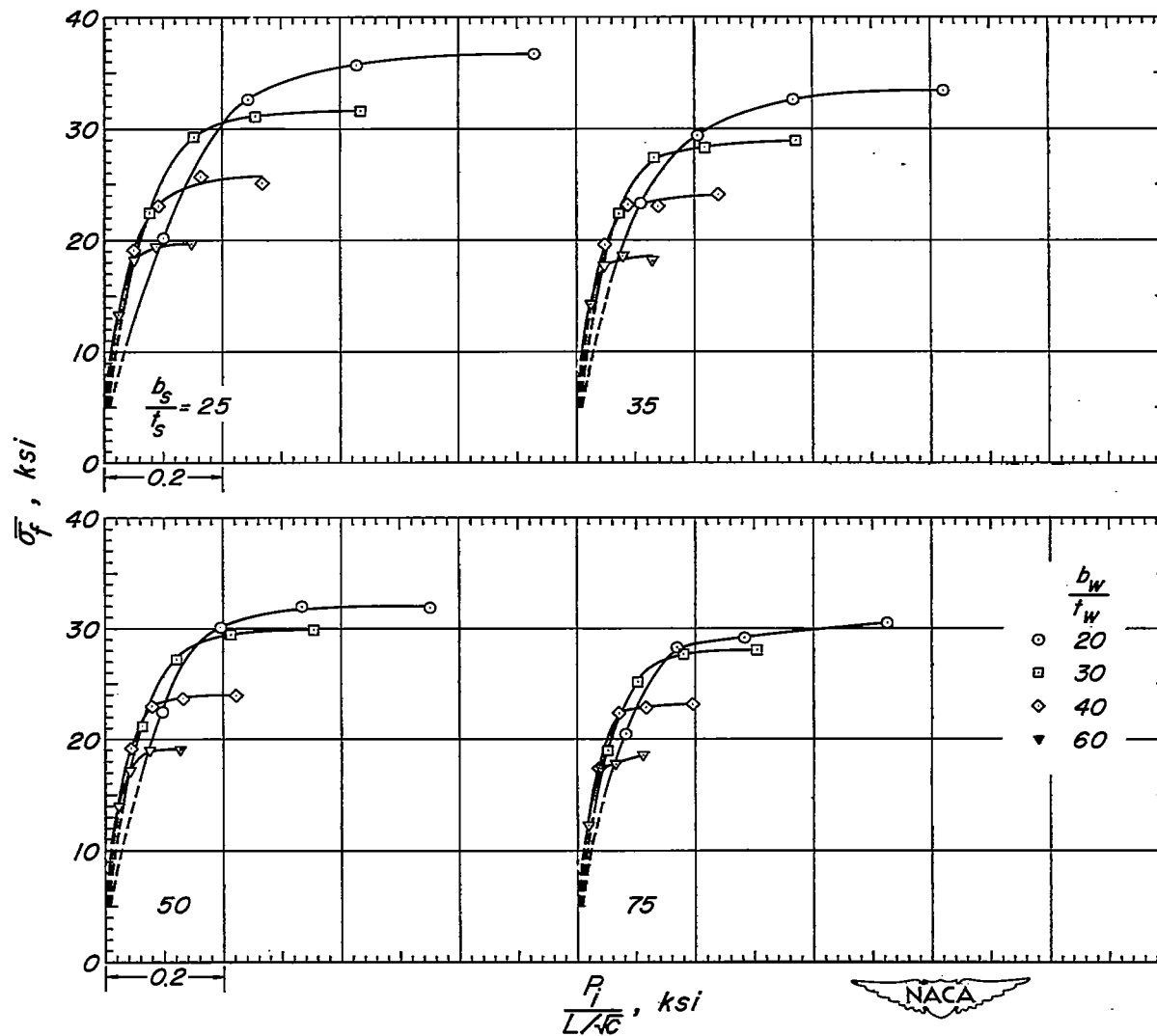


Figure 14.- Compressive strength of flat panels with hat-section stiffeners.

$$\frac{t_w}{t_s} = 1.00; \quad \frac{b_H}{b_w} = 1.2.$$

TABLE 13

TEST DATA FOR FLAT PANELS WITH HAT SECTION STIFFENERS WITH $\frac{t_w}{t_s} = 1.25$, $\frac{b_H}{b_W} = 0.6$

[Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------------------|--------------------|------------------------|----------|---------------------|-----------------------------------|
| t_w (in.) | $\frac{t_w}{t_s}$ | $\frac{b_s}{t_s}$ | $\frac{b_w}{t_w}$ | $\frac{b_H}{b_W}$ | $\frac{L}{\sqrt{b}}$ (in.) | $\frac{\tau}{t_s}$ | σ_{cr} (ksi) | | σ_f (ksi) | $\frac{P_1}{L/\sqrt{b}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (1.25) | (35) | (20) | (0.6) | | | | | | |
| .039 | 1.204 | 33.2 | 20.0 | .64 | 4.36 | | 34.9 | 32.4 | 38.2 | 0.749 |
| .039 | 1.203 | 34.0 | 20.2 | .60 | 7.28 | (2.680) | 36.7 | 35.3 | 38.0 | .446 |
| .039 | 1.207 | 34.0 | 19.8 | .65 | 11.59 | | -- | -- | 33.2 | .245 |
| .039 | 1.198 | 33.8 | 20.2 | .62 | 17.37 | | 19.3 | 18.0 | 20.8 | .102 |
| .040 | 1.240 | 35.2 | 30.2 | .62 | 6.91 | | -- | -- | 35.7 | .507 |
| .040 | 1.200 | 34.4 | 30.2 | .61 | 11.58 | (3.062) | 34.3 | 33.6 | 35.3 | .299 |
| .040 | 1.234 | 34.6 | 30.4 | .60 | 18.47 | | 31.3 | 30.6 | 32.3 | .171 |
| .039 | 1.208 | 34.2 | 30.6 | .60 | 27.53 | | 26.8 | 27.9 | 21.6 | .077 |
| .040 | 1.219 | 33.4 | 40.3 | .60 | 9.53 | | 30.0 | 30.0 | 31.3 | .355 |
| .040 | 1.212 | 34.1 | 40.4 | .60 | 15.85 | (3.375) | -- | -- | 29.1 | .198 |
| .039 | 1.222 | 35.1 | 40.5 | .60 | 25.27 | | -- | -- | 30.0 | .128 |
| .039 | 1.199 | 34.2 | 40.0 | .62 | 37.92 | | 18.7 | 18.2 | 20.6 | .059 |
| .039 | 1.205 | 34.2 | 61.0 | .60 | 14.46 | | 14.6 | 15.1 | 23.2 | .198 |
| .039 | 1.200 | 33.9 | 60.4 | .61 | 24.11 | (3.860) | 14.3 | 14.5 | 23.1 | .118 |
| .038 | 1.164 | 34.6 | 62.6 | .60 | 38.54 | | 13.9 | 15.2 | 22.3 | .071 |
| .040 | 1.200 | 33.6 | 60.2 | .60 | 57.85 | | 13.2 | 13.3 | 18.3 | .039 |
| .040 | 1.220 | (50) | (20) | .62 | 4.27 | | | | | |
| .040 | 1.223 | 48.2 | 19.8 | .64 | 7.11 | (2.360) | 24.1 | 22.8 | 36.6 | .647 |
| .040 | 1.230 | 49.2 | 19.8 | .64 | 11.33 | | 25.2 | 24.5 | 36.1 | .383 |
| .039 | 1.215 | 48.6 | 19.6 | .63 | 17.00 | | 28.5 | 27.1 | 30.5 | .203 |
| .039 | 1.188 | 48.6 | 30.4 | .60 | 6.94 | | 19.4 | 21.5 | 21.2 | .094 |
| .039 | 1.184 | 48.8 | 30.6 | .60 | 11.50 | (2.710) | 21.3 | 21.0 | 33.0 | .412 |
| .039 | 1.187 | 48.4 | 30.4 | .60 | 18.36 | | 24.9 | 23.9 | 33.0 | .249 |
| .039 | 1.204 | 49.0 | 30.3 | .60 | 27.40 | | 24.2 | 22.9 | 30.3 | .142 |
| .039 | 1.208 | 49.3 | 40.3 | .60 | 9.47 | | 19.5 | 18.7 | 20.6 | .065 |
| .039 | 1.208 | 49.4 | 40.4 | .60 | 15.79 | (3.000) | 23.3 | 23.2 | 29.2 | .296 |
| .039 | 1.218 | 49.4 | 39.6 | .60 | 25.22 | | 23.6 | 23.0 | 28.9 | .176 |
| .039 | 1.183 | 48.7 | 40.2 | .60 | 37.76 | | 19.9 | 19.4 | 27.2 | .103 |
| .039 | 1.197 | 49.6 | 60.8 | .60 | 14.48 | | 20.4 | 18.9 | 22.1 | .056 |
| .039 | 1.202 | 49.4 | 60.4 | .60 | 24.13 | (3.470) | 14.4 | 14.2 | 22.6 | .173 |
| .040 | 1.216 | 49.0 | 60.6 | .60 | 38.58 | | 13.4 | 13.1 | 22.2 | .102 |
| .040 | 1.202 | 47.6 | 60.6 | .60 | 57.92 | | 14.1 | 13.5 | 21.2 | .061 |
| | | | | | | | 13.6 | 12.5 | 18.1 | .035 |

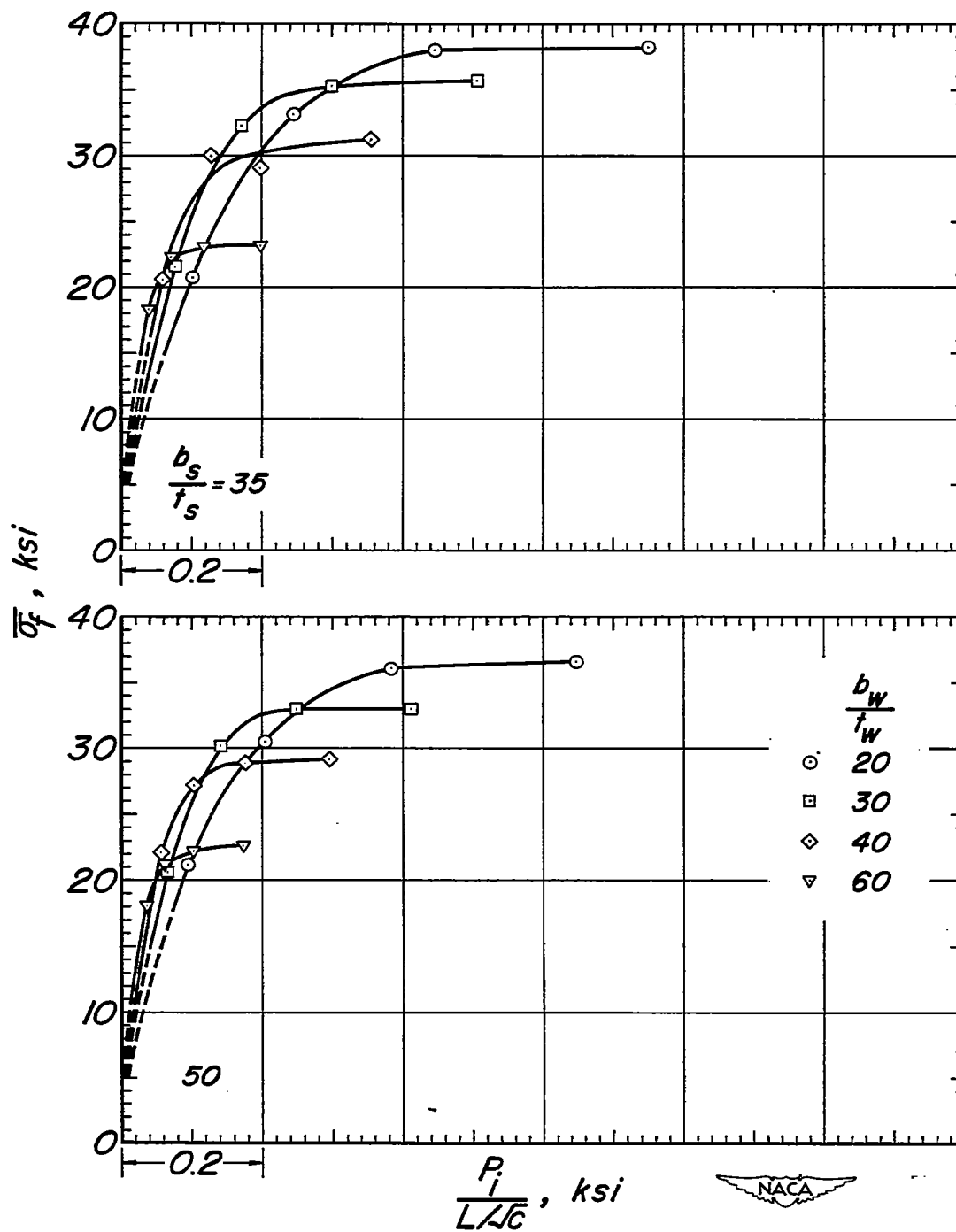


Figure 15.-Compressive strength of flat panels
with hat-section stiffeners. $\frac{t_w}{t_s} = 1.25$; $\frac{b_H}{b_w} = 0.6$.

TABLE 14

TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{t_w}{t_s} = 1.25$, $\frac{b_H}{b_w} = 0.8$

[Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------------------|--------------------|------------------------|----------|---------------------------|-----------------------------------|
| t_w (in.) | $\frac{t_w}{t_s}$ | $\frac{b_s}{t_s}$ | $\frac{b_w}{t_w}$ | $\frac{b_H}{b_w}$ | $\frac{L}{\sqrt{6}}$ (in.) | $\frac{\tau}{t_s}$ | σ_{or} (ksi) | | $\bar{\sigma}_t$ (ksi) | $\frac{P_1}{L/\sqrt{6}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (1.25) | (35) | (20) | (0.8) | | | | | | |
| .040 | 1.228 | 34.6 | 20.0 | .82 | 4.58 | (2.645) | 35.2 | 34.7 | 37.5 | 0.693 |
| .039 | 1.204 | 34.9 | 20.2 | .77 | 7.60 | | -- | -- | 36.4 | .406 |
| .039 | 1.208 | 34.0 | 20.2 | .82 | 12.16 | | -- | -- | 32.5 | .226 |
| .039 | 1.198 | 34.8 | 20.6 | .78 | 18.15 | | 19.3 | 19.2 | 21.2 | .099 |
| .039 | 1.221 | 35.2 | 30.6 | .80 | 7.22 | (2.985) | 28.8 | 29.5 | 34.7 | .458 |
| .040 | 1.220 | 34.1 | 30.1 | .82 | 12.05 | | 32.2 | 32.1 | 33.7 | .267 |
| .039 | 1.224 | 34.4 | 29.8 | .82 | 19.23 | | -- | -- | 29.8 | .148 |
| .040 | 1.210 | 35.0 | 30.2 | .81 | 28.83 | | 26.5 | 26.5 | 21.8 | .072 |
| .039 | 1.188 | 33.3 | 40.4 | .81 | 9.84 | (3.250) | 22.9 | 21.6 | 28.8 | .304 |
| .039 | 1.190 | 33.4 | 40.0 | .82 | 16.38 | | 23.2 | 22.8 | 28.8 | .183 |
| .039 | 1.182 | 33.8 | 40.3 | .82 | 26.23 | | 27.1 | 25.7 | 27.9 | .111 |
| .039 | 1.194 | 34.2 | 40.8 | .81 | 39.26 | | 20.6 | 20.0 | 22.1 | .059 |
| .039 | 1.184 | 34.0 | 60.8 | .81 | 14.91 | (3.640) | 12.7 | 12.0 | 21.7 | .169 |
| .039 | 1.211 | 35.0 | 61.0 | .80 | 24.88 | | 12.7 | 12.6 | 21.3 | .100 |
| .039 | 1.192 | 33.5 | 61.2 | .81 | 39.87 | | 13.3 | 13.8 | 20.4 | .060 |
| .039 | 1.199 | 34.7 | 61.4 | .79 | 59.75 | | 12.5 | 13.1 | 16.1 | .031 |
| .040 | 1.195 | 47.4 | 19.8 | .84 | 4.55 | (2.352) | 25.5 | 23.3 | 35.7 | .590 |
| .039 | 1.174 | 47.4 | 20.2 | .83 | 7.50 | | 25.2 | 23.0 | 35.2 | .353 |
| .039 | 1.200 | 48.8 | 20.4 | .81 | 11.97 | | 32.3 | 31.1 | 30.8 | .194 |
| .039 | 1.193 | 48.6 | 20.2 | .80 | 17.86 | | 21.2 | 20.0 | 22.1 | .093 |
| .040 | 1.216 | 48.2 | 30.2 | .80 | 7.19 | (2.672) | 25.6 | 25.2 | 32.4 | .386 |
| .040 | 1.198 | 47.8 | 30.9 | .80 | 11.94 | | 26.8 | 24.8 | 32.1 | .230 |
| .039 | 1.208 | 49.6 | 30.0 | .80 | 19.15 | | 25.2 | 24.7 | 29.6 | .132 |
| .039 | 1.199 | 49.6 | 30.6 | .80 | 28.62 | | 19.5 | 19.3 | 21.0 | .063 |
| .039 | 1.202 | 49.2 | 40.8 | .80 | 9.84 | (2.930) | 20.9 | 29.4 | 27.7 | .264 |
| .039 | 1.193 | 48.4 | 39.8 | .82 | 16.33 | | 21.1 | 28.6 | 27.5 | .158 |
| .040 | 1.227 | 50.6 | 39.6 | .80 | 26.11 | | 20.5 | 21.0 | 26.5 | .095 |
| .039 | 1.212 | 49.8 | 40.2 | .81 | 39.12 | | 19.6 | 19.4 | 20.7 | .050 |
| .040 | 1.222 | 48.9 | 60.8 | .80 | 14.96 | (3.320) | 13.7 | 13.1 | 21.0 | .149 |
| .040 | 1.189 | 49.2 | 60.7 | .80 | 24.92 | | 11.3 | 10.3 | 20.7 | .088 |
| .039 | 1.184 | 48.6 | 61.1 | .80 | 39.90 | | 10.2 | 9.8 | 19.3 | .051 |
| .040 | 1.169 | 47.3 | 61.5 | .79 | 59.82 | | 12.0 | 10.8 | 16.4 | .029 |


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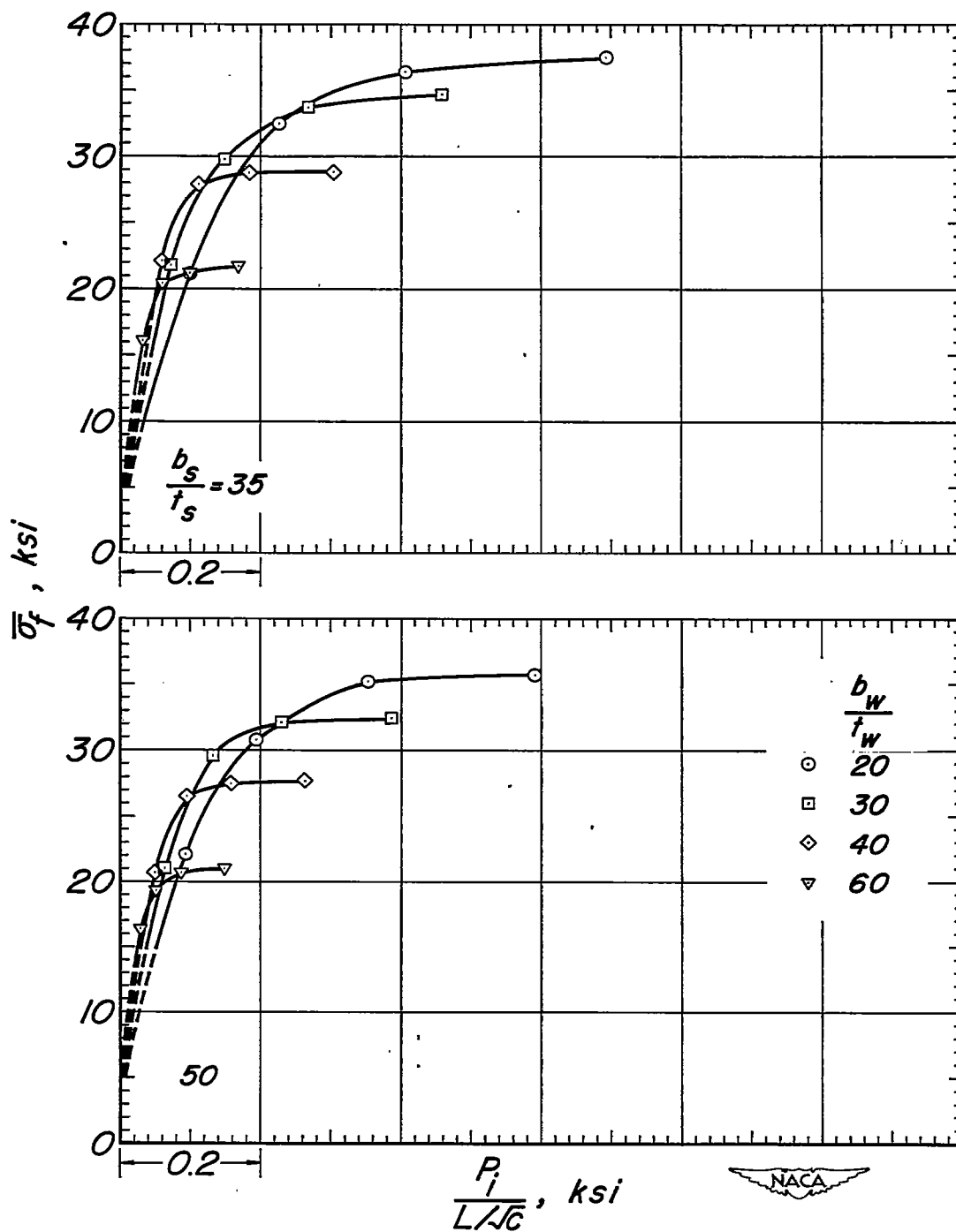


Figure 16.-Compressive strength of flat panels
with hat-section stiffeners. $\frac{t_w}{t_s} = 1.25$; $\frac{b_H}{b_w} = 0.8$.

TABLE 15
 TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{t_W}{t_S} = 1.25$, $\frac{b_H}{b_W} = 1.0$
 [Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------------------|--------------------|------------------------|----------|---------------------------|-----------------------------------|
| t_W (in.) | $\frac{t_W}{t_S}$ | $\frac{b_S}{t_S}$ | $\frac{b_W}{t_W}$ | $\frac{b_H}{b_W}$ | $\frac{L}{\sqrt{a}}$ (in.) | $\frac{\tau}{t_S}$ | σ_{cr} (ksi) | | $\bar{\sigma}_f$ (ksi) | $\frac{P_1}{L/\sqrt{a}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (1.25) | (35) | (20) | (1.0) | | | | | | |
| .039 | 1.214 | 34.3 | 20.4 | 1.00 | 4.74 | | 32.7 | 33.0 | 36.6 | 0.647 |
| .039 | 1.204 | 35.1 | 20.5 | .98 | 7.89 | (2.617) | --- | --- | 35.7 | .378 |
| .039 | 1.190 | 35.0 | 20.4 | .99 | 12.61 | | 30.8 | 29.6 | 32.4 | .215 |
| .040 | 1.198 | 34.6 | 21.0 | .96 | 18.87 | | 20.2 | 18.9 | 21.2 | .094 |
| | | | (30) | | | | | | | |
| .039 | 1.193 | 34.8 | 30.6 | .98 | 7.46 | | 27.5 | 26.3 | 32.7 | .410 |
| .039 | 1.223 | 35.1 | 30.1 | 1.04 | 12.44 | (2.920) | 25.2 | 26.2 | 32.8 | .247 |
| .039 | 1.216 | 35.2 | 30.3 | 1.01 | 19.84 | | 28.3 | 28.9 | 29.8 | .140 |
| .039 | 1.201 | 34.0 | 30.4 | 1.00 | 29.70 | | 20.7 | 19.6 | 22.2 | .070 |
| | | | (40) | | | | | | | |
| .039 | 1.195 | 34.4 | 40.9 | 1.00 | 10.07 | | 13.9 | 13.8 | 26.6 | .266 |
| .039 | 1.180 | 34.6 | 40.6 | 1.02 | 16.82 | (3.150) | 18.0 | 16.9 | 26.1 | .156 |
| .039 | 1.193 | 34.0 | 40.8 | 1.01 | 26.93 | | 17.9 | 18.0 | 25.2 | .094 |
| .039 | 1.212 | 33.8 | 39.3 | 1.02 | 40.38 | | 16.9 | 16.8 | 21.5 | .054 |
| | | | (60) | | | | | | | |
| .039 | 1.212 | 34.2 | 60.6 | 1.02 | 15.35 | | 8.3 | 8.3 | 20.0 | .145 |
| .040 | 1.210 | 33.6 | 60.0 | 1.00 | 25.50 | (3.472) | 8.2 | 8.0 | 20.2 | .088 |
| .039 | 1.200 | 34.2 | 60.8 | 1.00 | 40.82 | | 9.4 | 9.0 | 18.7 | .051 |
| .040 | 1.218 | 34.2 | 60.1 | 1.00 | 61.22 | | 9.2 | 9.0 | 14.5 | .026 |
| | | (50) | (20) | | | | | | | |
| .039 | 1.200 | 48.4 | 20.2 | 1.04 | 4.74 | | 24.1 | 22.8 | 34.0 | .538 |
| .040 | 1.210 | 48.6 | 20.0 | 1.04 | 7.79 | (2.348) | 25.5 | 24.4 | 33.4 | .322 |
| .040 | 1.218 | 49.4 | 19.8 | 1.00 | 12.43 | | 24.3 | 23.7 | 29.1 | .176 |
| .039 | 1.200 | 49.6 | 20.5 | .97 | 18.63 | | 19.0 | 18.4 | 20.9 | .084 |
| | | | (30) | | | | | | | |
| .039 | 1.145 | 46.6 | 30.6 | 1.01 | 7.44 | | 25.0 | 22.2 | 31.4 | .356 |
| .039 | 1.196 | 48.8 | 30.6 | .99 | 12.35 | (2.640) | 23.7 | 22.5 | 31.0 | .212 |
| .039 | 1.203 | 48.8 | 29.8 | 1.02 | 19.68 | | 24.8 | 23.8 | 28.3 | .122 |
| .039 | 1.198 | 48.2 | 30.8 | 1.00 | 29.53 | | 19.8 | 18.5 | 20.9 | .060 |
| | | | (40) | | | | | | | |
| .040 | 1.228 | 49.9 | 40.0 | 1.00 | 10.06 | | 16.2 | 16.2 | 25.8 | .235 |
| .040 | 1.217 | 49.1 | 40.2 | 1.00 | 16.82 | (2.870) | 17.5 | 16.7 | 25.6 | .140 |
| .039 | 1.203 | 51.9 | 41.4 | .97 | 26.88 | | 17.2 | 16.4 | 23.7 | .081 |
| .039 | 1.201 | 50.0 | 39.4 | 1.02 | 40.30 | | 16.1 | 15.5 | 20.8 | .047 |
| | | | (60) | | | | | | | |
| .040 | 1.232 | 49.9 | 60.7 | .99 | 15.34 | | 9.3 | 9.2 | 19.8 | .133 |
| .040 | 1.214 | 49.1 | 60.4 | 1.20 | 25.60 | (3.200) | 11.1 | 16.1 | 19.8 | .079 |
| .040 | 1.196 | 49.4 | 60.2 | 1.00 | 40.85 | | 9.5 | 9.2 | 18.1 | .045 |
| .040 | 1.204 | 48.5 | 60.8 | .97 | 61.30 | | 10.8 | 10.4 | 14.5 | .024 |

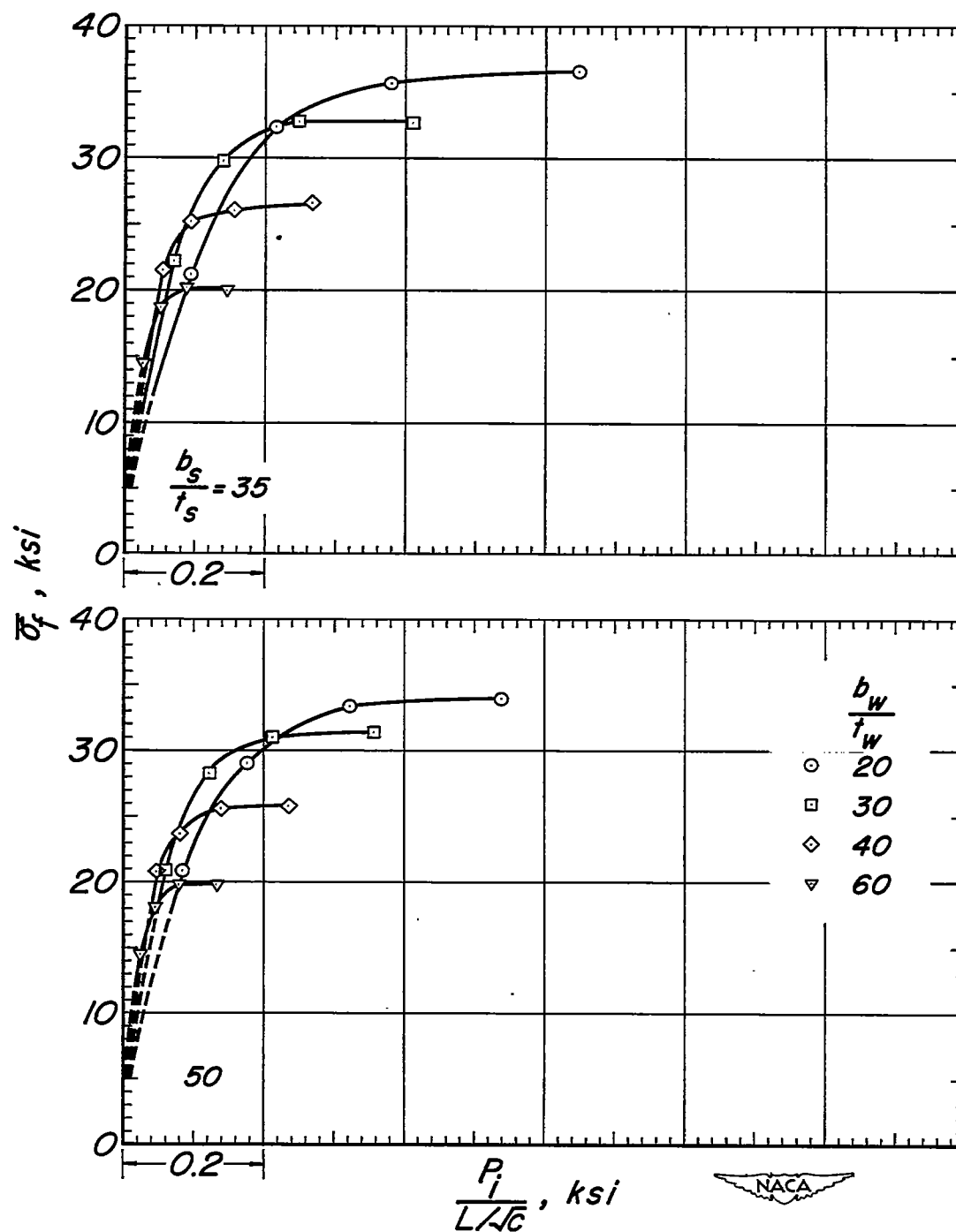


Figure 17.-Compressive strength of flat panels
with hat-section stiffeners. $\frac{t_w}{t_s} = 1.25$; $\frac{b_H}{b_w} = 1.0$.

TABLE 16

TEST DATA FOR FLAT PANELS WITH HAT-SECTION STIFFENERS WITH $\frac{b_W}{t_S} = 1.25$, $\frac{b_H}{b_W} = 1.2$

[Nominal proportions are given in parentheses]

| Proportions of test specimens | | | | | | | Test data | | | |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------------------|-----------------|------------------------|----------|---------------------|-----------------------------------|
| t_W (in.) | $\frac{t_W}{t_S}$ | $\frac{b_S}{t_S}$ | $\frac{b_W}{t_W}$ | $\frac{b_H}{b_W}$ | $\frac{L}{\sqrt{b}}$ (in.) | $\frac{t}{t_S}$ | σ_{cr} (ksi) | | σ_r (ksi) | $\frac{P_1}{L/\sqrt{b}}$ (ksi) |
| | | | | | | | Observed | Adjusted | | |
| (0.040) | (1.25) | (35) | (20) | (1.2) | | | | | | |
| .040 | 1.207 | 35.0 | 20.2 | 1.20 | 4.89 | | 26.4 | 25.2 | 34.8 | 0.591 |
| .040 | 1.200 | 34.7 | 20.0 | 1.20 | 8.08 | (2.595) | 32.8 | 31.3 | 34.7 | .357 |
| .037 | 1.140 | 34.8 | 21.5 | 1.20 | 13.02 | | 30.6 | 30.4 | 31.2 | .199 |
| .040 | 1.204 | 34.6 | 20.0 | 1.21 | 19.40 | | 21.1 | 20.5 | 22.6 | .097 |
| .040 | 1.202 | 34.8 | 30.3 | 1.19 | 7.65 | | 19.5 | 18.3 | 31.3 | .376 |
| .039 | 1.192 | 33.8 | 29.8 | 1.22 | 12.68 | (2.868) | 21.6 | 20.6 | 31.7 | .230 |
| .039 | 1.190 | 33.3 | 29.9 | 1.23 | 20.31 | | -- | -- | 29.6 | .134 |
| .039 | 1.182 | 33.2 | 30.4 | 1.23 | 30.44 | | 20.4 | 19.6 | 21.8 | .066 |
| .039 | 1.188 | 33.4 | 39.6 | 1.24 | 10.34 | | 19.8 | 20.7 | 25.0 | .237 |
| .039 | 1.192 | 34.5 | 40.2 | 1.21 | 17.23 | (3.070) | 19.9 | 20.4 | 24.6 | .140 |
| .039 | 1.238 | 35.2 | 39.8 | 1.24 | 27.58 | | 14.0 | 14.5 | 23.2 | .083 |
| .039 | 1.193 | 34.4 | 39.7 | 1.23 | 41.29 | | 14.6 | 13.5 | 18.8 | .045 |
| .040 | 1.212 | 34.2 | 59.6 | 1.21 | 15.65 | | 9.1 | 9.1 | 19.2 | .131 |
| .039 | 1.214 | 33.4 | 60.6 | 1.20 | 26.05 | (3.340) | 9.2 | 9.6 | 19.1 | .078 |
| .039 | 1.222 | 35.2 | 61.4 | 1.18 | 41.67 | | 8.1 | 8.2 | 17.3 | .044 |
| .040 | 1.214 | 34.6 | 61.0 | 1.18 | 62.44 | | 8.2 | 8.2 | 13.6 | .023 |
| .039 | 1.184 | 48.4 | 20.0 | 1.24 | 4.85 | | 25.7 | 24.4 | 35.0 | .541 |
| .039 | 1.214 | 48.3 | 20.0 | 1.21 | 8.02 | (2.340) | 25.8 | 24.4 | 33.3 | .311 |
| .040 | 1.194 | 48.3 | 20.1 | 1.19 | 12.77 | | 25.5 | 24.2 | 29.5 | .173 |
| .039 | 1.212 | 50.1 | 20.2 | 1.20 | 19.21 | | 19.0 | 18.8 | 21.2 | .083 |
| .039 | 1.186 | 48.4 | 30.7 | 1.20 | 7.58 | | 18.7 | 18.1 | 29.6 | .327 |
| .039 | 1.198 | 49.4 | 30.1 | 1.21 | 12.64 | (2.615) | 19.9 | 18.5 | 29.4 | .194 |
| .039 | 1.200 | 50.0 | 30.2 | 1.20 | 20.23 | | 20.8 | 19.6 | 27.3 | .113 |
| .039 | 1.202 | 48.8 | 30.6 | 1.19 | 30.30 | | 18.6 | 17.7 | 20.3 | .056 |
| .040 | 1.182 | 47.1 | 40.2 | 1.20 | 10.33 | | 11.7 | 11.0 | 24.4 | .213 |
| .039 | 1.202 | 49.0 | 40.4 | 1.20 | 17.19 | (2.820) | 12.8 | 12.3 | 24.0 | .126 |
| .040 | 1.212 | 49.2 | 40.0 | 1.20 | 27.43 | | 11.0 | 10.6 | 22.0 | .072 |
| .040 | 1.178 | 48.2 | 40.0 | 1.20 | 41.12 | | 14.0 | 12.5 | 18.0 | .039 |
| .039 | 1.209 | 49.5 | 61.0 | 1.20 | 15.71 | | 5.1 | 5.0 | 18.3 | .116 |
| .039 | 1.215 | 49.8 | 60.6 | 1.20 | 26.10 | (3.115) | 9.6 | 9.4 | 18.5 | .071 |
| .039 | 1.211 | 49.2 | 60.4 | 1.20 | 41.75 | | 7.0 | 8.3 | 17.2 | .041 |
| .040 | 1.208 | 50.3 | 60.4 | 1.20 | 62.46 | | 7.6 | 7.7 | 13.1 | .021 |



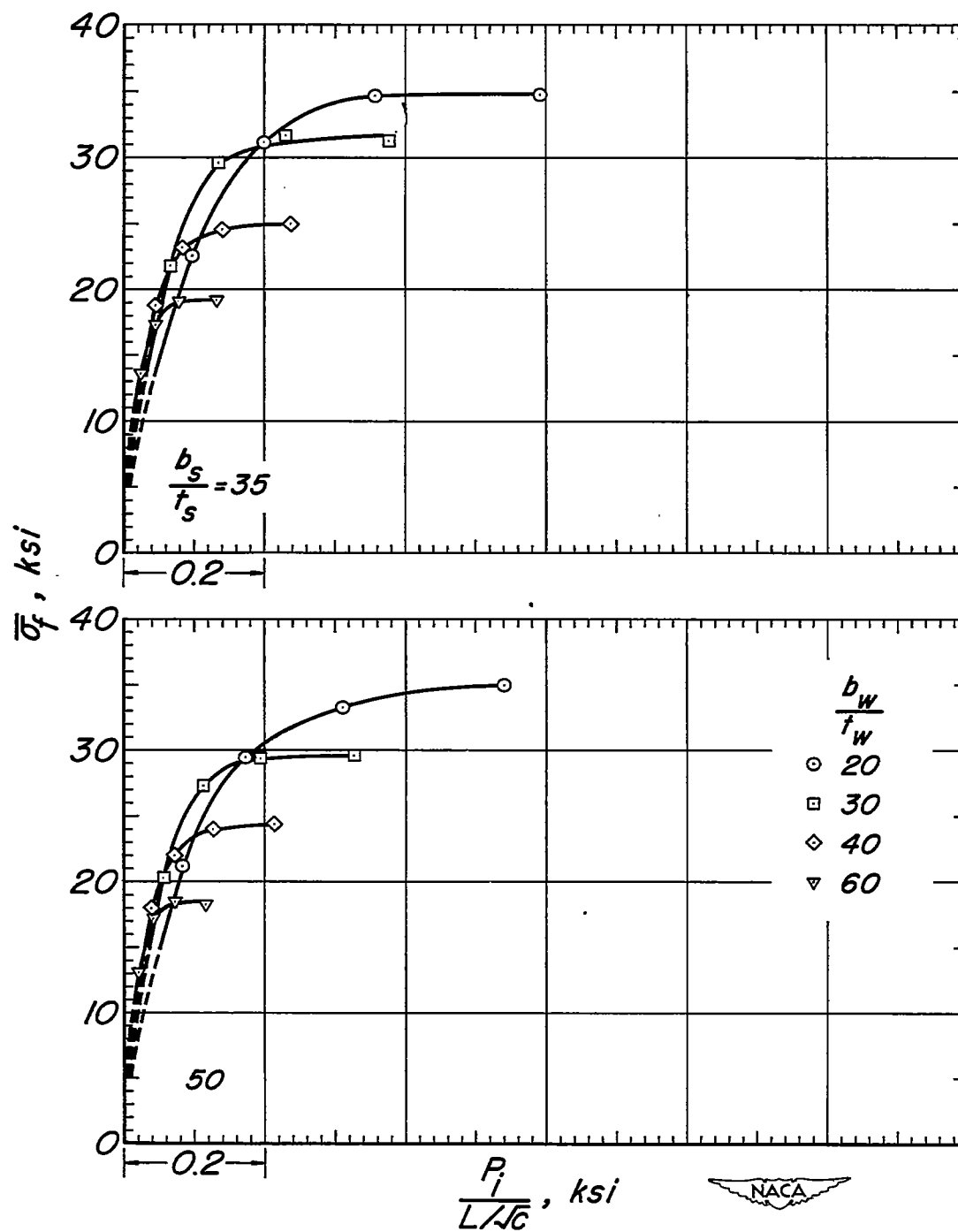


Figure 18.-Compressive strength of flat panels
with hat-section stiffeners. $\frac{t_w}{t_s} = 1.25$; $\frac{b_H}{b_w} = 1.2$.